T H E S I S

on

AN INVESTIGATION INTO THE CHANGES PRODUCED IN THE BLOOD BY OPERATIONS AND FRACTURES.

by

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April 1905.

I N D E X .

I N D E X (Contd.)

AN INVESTIGATION INTO THE CHANGES PRODUCED IN THE BLOOD BY OPERATIONS AND FRACTURES.

The following research has been carried out in order to elucidate, as far as possible, the following points in the condition of blood after operations.

I. Does any change take place in the corpuscular elements and Haemoglobin?

Judging from analogy one would suppose that there would be a certain amount of leucocytosis in order to remove the broken down tissues which are present even after the simplest and most carefully conducted operation. Practically no work seems to have been done in this country or in Europe, but some researches have been carried out in America. (These are mentioned later on).

II. After the investigation of the first few cases it was found that there were marked changes in the leucocytes. The first point was to find out if these changes were in any way dependent on the loss of blood. For this purpose a series of cases were taken (a) where the blood lost was at a minimum as in hernia operations and appendectomies. (b) A second /

second series where there was slightly more blood loss. (c) and a third series where there was a considerable blood loss. The haemorrhage was not at all in proportion to the severity of the operation as most of the cases in class (b) were more serious than those in class (c). No case was gone into where there was extreme blood loss along with other tissues as amputation.

III. The next question taken up was the influence of the anaesthetic on the blood change. An endeavour was made to shew that these changes are due to the operation and not to the anaesthetic. It has been unfortunate that more cases were not available where a local anaesthetic was given while a major operation was being performed.

The means adopted have been:-

1. Investigation of 2 cases where a local anaesthetic was employed.

2. Investigation of one case where a general anaesthetic was given and no cutting operation performed.

3. Investigation of the blood of a dog for several days prior to and after the administration of Chloroform. The experiment was repeated.

An/

An endeavour has also been made to find out if there is any difference in the anaesthetics in regard to their effects on the leucocytes. This has been attended with great difficulty as Chloroform was given in the vast majority of instances, and in the others the various mixtures or sequences were employed.

(b) As a sequence to the above it was found that there was a considerable difference in the action of the general anaesthetics on the Red Blood Corpuscles. It being apparent that while both had a considerable haemolytic power, that of Ether was much greater than that of Chloroform, and that from this point of view Ether was much more dangerous to use where the patient was extremely anaemic.

IV. (a) The temperature in traumatic fever after operation was at first the basis of the investigations but it was soon found to be an unimportant element as the changes in the leucocytes were found to have no apparent connection with the temperature, as very often where the temperature never went above normal, the leucocytosis was extremely high; and vice versa, where the temperature rose to 100° (as it did in a few cases) the leucocytosis was frequently low: also the temperature usually did not rise/

rise till the leucocytes had declined considerably.

(b) Following on the above, it was decided to investigate a series of cases of Fracture (this is the other class of case which gives us the best examples of the so called traumatic fever). Only those fractures which necessitated the patient being kept in bed were taken up. In fracture we get considerable bruising and damaging of the tissues, usually much in excess of what occurs in a simple operation such as radical cure for hernia, appendectomy etc. also in some cases we get considerable extravasation of blood, so, if the leucocytosis after operation is simply due to the endeavour of the body to remove waste material, we should expect the same here, whereas if the change is due to some other factor such as would come through a wound, we would not find the leucocytosis present. Of course fractures are not subjected to the same, almost starvation diet that operation cases are.

V. Other points were then taken up and investigated in connection with the preliminary preparation of the patient (1) general (2) local - along with the effects of antiseptics and scrubbing.

VI. The Glycogen reaction was tested in every case.

CLINICAL /

CLINICAL RESULTS

The real object of these investigations was to find out if routine blood examination would be as useful in surgical as in medical cases. Of course it is well known that this blood examination is often of great value in determining in a certain type of case whether operation is required or not. But so far practically no attempt has been made to use blood methods in general surgical work.

I. After operation the case is often puzzling: the patient appears worse than he should be, the temperature perhaps is higher than one expects, and there may be considerable pain and we are unable to say if anything has gone wrong with the wound or not. Of course in the vast proportion of cases, the dressing of the wound would tell us at once whether all was right or not; by seeing whether the dressing was dry or not, and whether the edges were inflamed; but there are many cases where we wish to disturb the patient as little as possible by dressing, and also even the appearance of the wound may fail us. It was in the hopes that in such cases as these, the blood examination might help towards a prognosis and might perhaps direct us to treatment.

II. In/

II. In cachectic patients and those otherwise very anaemic, severe operations are often necessary; in some cases such can be done under a local anaesthetic, in others a general anaesthetic is better. From blood examination prior to operation one might be able to determine the respective risks undergone by using general or local anaesthaesia, and we might be in a position to say whether Chloroform or Ether is the safer, in regard to its action on the blood and thus on various other tissues and systems.

METHODS ADOPTED.

I. ROUTINE EXAMINATION of the LEUCOCYTES was made at least once before operation usually about 20 hours before, and as much as possible at the same time of day as the 2nd examination was made. It was unfortunately found impossible to count the corpuscles just before the operation. The apparatus used was the Thama-Zeiss Haemocytometer with the Zappert modification in the ruling; by the means of this modification one was able in every case to count five sets of 400 squares, and in certain cases a second series of five sets of 400 squares were counted, thus accuracy was assured as far as possible.

II. A differential count was also made;

here /

here, between 400 and 500 leucocytes were counted on a film stained by Jenner's method, (in a few cases Leistmann's stain was used). The films have in all cases been made on slides, as in that way a larger surface of blood can be examined and because the film can be made more clearly and can be more evenly spread out. It has this disadvantage that there is a tendency for the leucocytes to be dragged to the end of the film, and to accumulate there, but by careful observation it has been found that the percentage of the various leucocytes there, is practically the same to what it is in the remainder of the film, and where there has been variation it has been obviated to a large extent, as the corpuscles were counted in each case from end to end of the film, thus reducing the error to a minimum. As all the films were prepared in the same way the comparisons can be counted upon. After the leucocytes were counted, their relative and absolute numbers were calculated and tabulated.

III. Similar counts and calculations were made. (1) On the day of operation usually 2 to 4 hours after it; in some cases immediately or about 1 hour after it.

(2) The day after operation.

(3) Usually 2 or 3 times again: in some cases/

cases daily and in others every second day.

IV. The Glycogen was examined for in almost every film by using a solution of Iodine, Potassium Iodide and gum acacia.

V. In more than half the cases the red blood corpuscles were counted, prior to operation and after it for several days: here the Thoma-Zeiss instrument was again used, 5 sets of 16 squares being counted.

VI. The Haemoglobin was estimated in 5 cases with Gower's instrument. The estimates by this instrument are not absolutely accurate, but as the same instrument was used on each occasion, in each case they are naturally in proportion.

VII. Routine blood examination was carried on in the same way through a series of fracture cases: it was, of course quite impossible to get the blood examined here previous to the fracture.

An endeavour was made to avoid as far as possible the physiological changes in leucocytes due to digestion. In all the operation cases, this is entirely obviated after operation, as patient is on a starvation diet; but in counts previous to operation and in some of the fracture cases it is not possible to/

to obviate this condition completely.

The average number of the Leucocytes previous to operation was 8,300, which is slightly higher than the average ordinarily given.

The following cases were the only ones with a preliminary count of over 10,000.

Case 27. J. H. aged 41, suffering from Carcinoma of the Oesophagus, was markedly cachectic and would not have been examined if a local anaesthetic had not been employed.

Case 50. J. M. D. aged 11, suffering from paralysis of lower limbs but apparently in good general health. Count taken at 1 p.m. was 15,000 and after operation it fell only to 14,600.

Case 25. J. W. aged 58, count 10,200 previous to exploratory laparotomy but nothing definite was found at operation.

The average percentage of PolymorphoNuclears was 60.5: this is slightly lower than that usually found and may be due to the impossibility of absolutely excluding the changes caused by digestion in the counts prior to operation.

The only two cases that averaged 75% or upwards were

Case/

Case 27 as above, J. H. 75.5%

Case 42 Mrs St. aged 62 - 80%

Patient has suffered from Scirrhus for some months. The count is 4,400,000 red & 7,200 leucocytes; the polymorphs drop to 74% several days after operation.

The Cases have been divided into the following groups.

A. Operations where the minimum of blood was lost.
B. Operations where slightly more blood was lost.
C. Operations where there was considerable haemorrhage but at no time excessive.
D. Fractures.

S E R I E S A. subdivided into

1. Operations for radical cure of Hernia Inguinal & Femoral. (6 cases)
2. Laparotomies

   A. Appendicitis, all were in the quiescent stage and in none was there any suggestion of pus at the operation. (10 cases)
   B. Exploratory and Gastroenterostomies (7 cases)

3. Operations on knee joint for semilunar cartilage /

cartilage. (3 cases)

4. Several other operations such as

(a) Undescended testicle.
(b) Varicose Veins
(c) Varicocele
(d) Stiff jaw (6 cases)

S E R I E S B. subdived into

1. Laparotomies for Ventral and Umbilical Hernia. (5 cases)
2. Simple operations on breast as removal of cysts and adenoids. (2 cases)

S E R I E S C. subdivided into

1. Bone operation, excision of knee joint.
2. Amputation of Breast and clearing out of Axilla etc. (7 cases)

In each case unless otherwise stated, the operation was performed about 11 a.m. on the day of the 2nd blood examination.

All the cases healed apparently aseptically with the following exceptions. Cases 10 & 35 where late Bacillus Coli Communis abscess developed.

CASE 2 which was the only case that was decidedly septic.

CASE 48 where it was doubtful whether it was merely tuberculous or not.

CASES /

CASES 17 & 19 where the knee joints gave rise to anxiety but no real evidence of sepsis was obtained.

The calculations are all made per cubic millimetre of blood.

(1) Red Blood Corpuscles

(2) Leucocytes. (a) total count
(b) absolute count for different varieties.

The varieties of the Leucocytes counted have been described under the following terms.

I. POLYMORPHONUCLEAR CELLS are usually 2 or 3 times as large as the ordinary red cell. The protoplasm is reticulated with numerous neutrophile granules (or very faintly eosinophile) the nuclei are elongated and constricted or composed of 2 or more lobes usually connected by threads of chromatin. The nucleus usually stains deep blue with Jenner. For shortness this cell is called simply a Polymorph.

The MONONUCLEATED CELLS have been very difficult to differentiate accurately into the several groups but as, as far as possible the same standard has been applied to the various films, the results are comparable.

II. The/

II. The SMALL MONONUCLEATED CELL or small lymphocyte is about the size of a red blood corpuscle, or may be slightly larger. It has a large circular nucleus, which with Jenner stains deep blue. There is very little non-granular protoplasm, surrounding the nucleus; this stains faintly basophile.

III. The LARGE MONONUCLEATED CELL varies from 2 to 5 times the size of a red blood corpuscle. It may be a large lymphocyte cell with nearly the same appearance and staining reaction as the small one, or it may be one where there is far more protoplasm and where the nucleus does not stain so deeply, but they are all essentially non-granular & basophile.

IV. The TRANSITIONAL is usually a large mononucleated cell where the nucleus is indented and appears reinform with the concavity towards the centre of the cell: sometimes the nucleus is otherwise moulded. This also is essentially a basophile non-granular cell.

V. EOSINOPHILES are cells about twice the size of a red blood corpuscle, with a polymorphous nucleus and protoplasm studded with coarse eosinophilous granules.

VI. Mast/

VI. Mast Cells are usually about twice the size of a red blood corpuscle, with a nucleus which is either polymorphous, or round. Over this nucleus and around it in the protoplasm are studded granules which may be fine or coarse, but these always stain deeply basophile.

S E R I E S of O P E R A T I O N C A S E S

HERNIA OPERATIONS

CASE I. A.C. aged 42 (m) had been suffering from reducible Inguinal Hernia for some years. Patient was well developed and in good general health. The operation was on the 8th Novr. and patient made excellent recovery; at no time was there suspicion of any infection of the wound. The anaesthetic employed was Chloroform, patient being under its influence for 45 minutes. The Temperature rose on the 9th Novr. to 99.8° and on the 10th to 100.2° and then came down and continued about 98.4°. This was one of the highest temperatures recorded but patient otherwise was perfectly comfortable.

Blood. The Red Blood Corpuscles shewed a slight increase but nothing abnormal was noticed in the/

the stained specimens.

The Leucocytes were at their highest 28 hours after operation reaching 14,600 per C. M. and on the third day after operation they had returned to normal.

The differential count shewed an increase of nearly 10% of the Polymorphs noticed within 4 hours after operation and continuing till the total count had returned to normal.

The other points to be noted are the large number of Large Mononucleateds found on day after operation, and the large number of Eosinophiles found before operation, and the fact specially shewn by the absolute count that there was an enormous increase of Large Mononucleateds on day after operation, the increase being proportionately greater than the increase in Polymorphs, while the variation in the Small Mononucleateds was not at all marked.

NOTES on the TEMPERATURE & LEUCOCYTE CURVE

Although the temperature had not risen till the day after the operation, the leucocyte curve was high up and by the time the temperature was at its maximum/

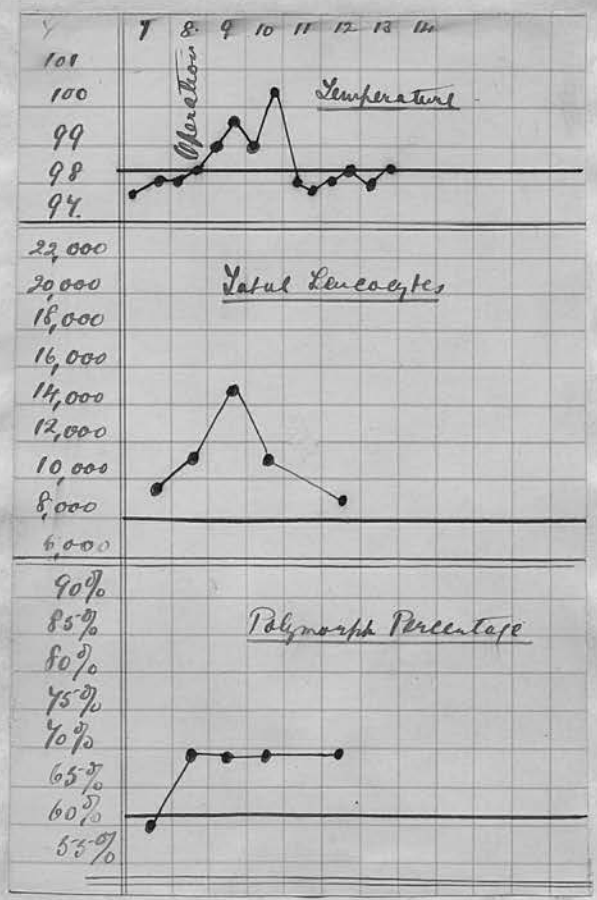
maximum on the evening of the 10th the leucocytes were almost back to their normal. Although the polymorphs continued high, after the temperature and total leucocyte count were at normal, they were never much above normal count.

BLOOD COUNT and PROPORTIONAL DIFFERENTIAL.

	Red.	Leuc.	Poly.	Sm.	L.	T.	E.
7th 4 P.M.	4,800,000	9,800	60	27	5	2	6
8th11 a.m.	Operation radical cure.						
8th 4 p.m.	4,900,000	10,800	70	22	6	0.5	1.5
9th 4 p.m.	5,000,000	14,600	68	17.5	12.5	-	2
10th 4 p.m.	-	10,800	69	20	7	1	3
11th 4 p.m.	-	9,000	70	22.5	6	0	1.5

GLYCOGEN REACTION & ABSOLUTE COUNT.

	Poly.	S.M.	L.M.	T.	E.	
7th	5,800	2647	490	195	588	negative
8th	7,560	2376	648	54	162	negative
9th	9,928	2555	1825	-	292	negative
10th	7,452	2160	756	108	324	
11th	6,300	2025	540	-	135	



CASE 2 A. S. age 30, was in hospital with a swelling in groin; patient was healthy and vigorous. The operation was on 22nd Novr. a gland being removed and radical cure at the same time performed for Femoral Hernia. The anaesthetic used was Chloroform and patient was anaesthetised for 45 minutes. This case was of special interest as after the temperature fell from the initial rise after the operation, it started to go up again and continued swinging for some time. There was some irritation around the wound, but no pus or serum was found, but the wound would not heal and another operation was performed about 6 weeks later.

TEMPERATURE. The rise on the day after operation was to 100.2° then gradually it came down to normal on third day after operation, and then rose again that evening and continued swinging between 100° & 97°.

THE BLOOD. The Leucocytes were at their highest 28 hours after the operation, the increase being 10,000. On the 8th day they had returned to normal in spite of the swinging temperature and irritation of the wound. The differential count shewed a great increase in the Polymorphs rising to 84½% 28 hours after operation but returning to below their normal on/

on the 8th day. The Eosinophiles were very scarce and were only found on two occasions. Here again a great increase in Large Mononucleateds was seen on day of operation and after.

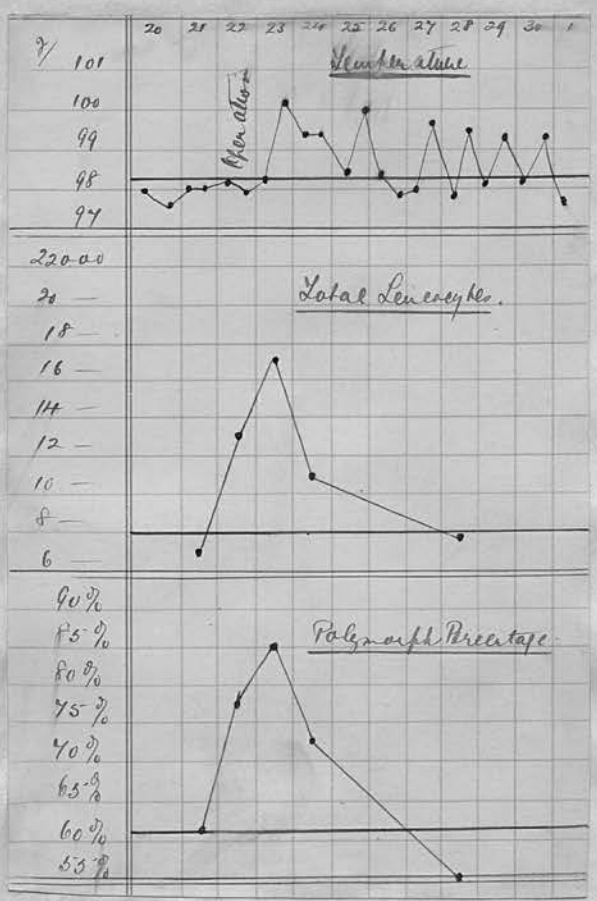
THE CURVES. The temperature, total leucocyte and polymorph percentage curves shew - (1) almost complete agreement between the total leucocyte and the polymorph percentage curve. On the 23rd all three curves were at their maximum, whereas while the temperature remained up and swinging the other two were down to normal by the 29th.

BLOOD EXAMINATION & PROPORTIONAL COUNT.

			Poly	S.M.	L.M.	T.	E.
21st	4 p.m.	W. 7,000	61	30	8	1	0
22	11.	Operation					
22	4 p.m.	W.13,000	77	14	8.5	0.5	-
23	4 p.m.	W.17,000	84.5	12	3	0.5	-
24	Noon	W.11,000	73.5	16	9.0	0.75	0.75
29	4 p.m.	W. 6,800	52	42.5	4	0.5	1

GLYCOGEN REACTION & ABSOLUTE COUNT.

	Poly.	S.M.	L.M.	T.	E.	
21st	4270	2100	560	70	0	
22nd	10010	1820	1105	65	0	very faint positive
23rd	14365	2040	510	85	0	faint positive
24th	8086	1760	990	82	82	very faint positive
25th	3536	2890	272	34	68	very faint positive



CASE 3. H. H. male aged 23, suffering from Inguinal Hernia. Patient was fairly muscular and in good health. The operation Radical Cure was on 25th Novr. and patient was anaesthetised for about 45 minutes; Chloroform being used. Patient made an excellent recovery the wound healing by first intention with no sign of irritation.

NOTES on the TEMPERATURE. On the 23rd previous to operation temperature was 99° and again it was 99 on evening of operation (25th) and again on evening of 26th, and it rose to 99.4°on the evening of the 27th. After this it came down to normal and remained there.

THE BLOOD. The Red Blood Corpuscles shewed a distinct decrease 24 hours after the operation of 625,000.

The Leucocytes prior to operation were fairly high 10,000 and the percentage of polymorphs was also high 71.5. The maximum was 4 hours after operation when the leucocytes reached 15,000 and the polymorphs 78%. Both fell on the 5th day after operation to below their own standard. The absolute count shews that the increase in the leucocyte was also taken part in by the Small & Large Mononucleateds on/

on day of operation and that the Large Mononucleateds continued in excess till the 5th day.

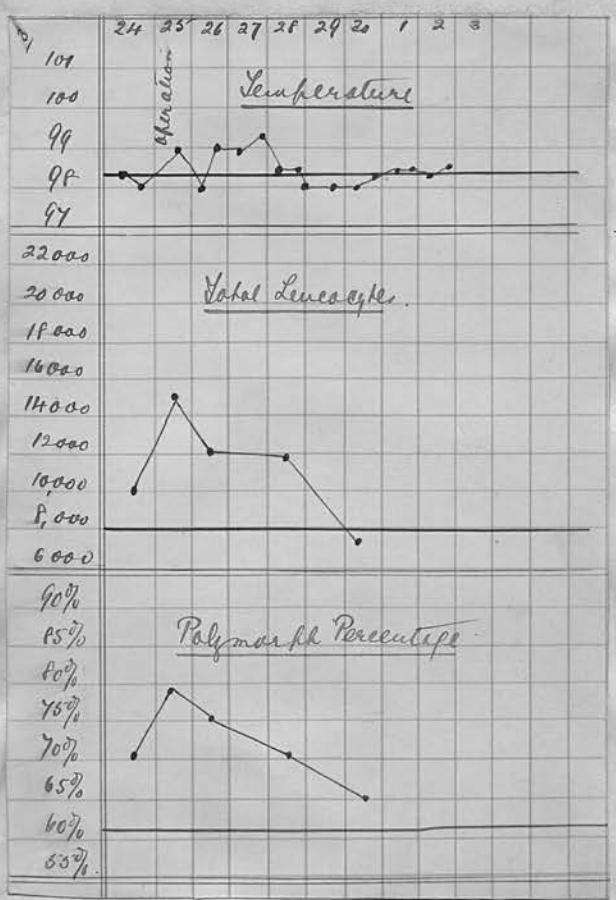
THE CURVES. Temperature, Total Leucocyte & Proportional Polymorph again shew a difference, the temperature rising only to 99° when the other two curves were at their maximum and when the temperature was at its maximum on the 27th (2nd day) the other two had fallen considerably. Again the temperature had resumed its normal before the Leucocytes and percentage Polymorphs had.

BLOOD EXAMINATION & PROPORTIONAL COUNT.

	REDS	L.	POLM.	S.M.	L.M.	T.	E.
24 4 pm	5125000	10000	71.5	18	7.5	2	1
25 4 pm	-	15000	78	15	5.5	1.25	0.25
26 12 N.	4500000	12000	75.5	15	7.5	1.75	0.25
28 4 pm	-	11800	70	16.5	9.25	2.25	2
30 4 pm	-	6800	65	21.5	10.5	1.25	1.75

GLYCOGEN REACTION & ABSOLUTE COUNT.

	TOTAL	POLM.	S.M.	L.M.	T.	E.	
24	10000	7150	1800	750	200	100	negative
25	15000	11700	2250	825	187	38	very faint positive
26	12000	9060	1800	900	210	30	" " "
28	11800	8260	1947	1091	266	236	negative
30	6800	4420	1462	714	85	119	"



CASE 4. Mrs D. aged 39, was admitted to the Infirmary suffering from reducible Femoral Hernia. Patient was rather a thin nervous woman but apparently otherwise in good health. Radical Cure was performed on the 1st Decr. patient being anaesthetised for about 45 minutes (Chloroform). Patient made a good recovery although there was a slight tendency to sickness after the operation. Wound healed by first intention.

NOTES on TEMPERATURE. There was never any rise of temperature, the highest recorded being 98.6 . It was a good instance of a major operation being followed by absolutely no traumatic fever.

BLOOD. The Leucocytes reached their maximum on the 1st count after operation (4 hours) 17,600 and the percentage of polymorphs rose as high as 90.5 at the same time,(and on the 5th polymorphs 65%.) Both gradually declined,but on the 6th inst. the polymorphs had risen to 73% and continued as high as 72% on the 9th, 7 full days after operation, while by this time the total leucocytes had fallen below their standard. The Eosinophile decreased only 0.5% after operation while their absolute numbers did not decrease at all and on the 9th inst. no Eosinophiles were counted.

The/

The absolute count shews a most marked decrease of total numbers of Small Mononucleateds on day of operation, and continuing until the 3rd day. On the other hand the Large Mononucleateds shew a considerable rise on the day after and continuing till the 3rd day after operation.

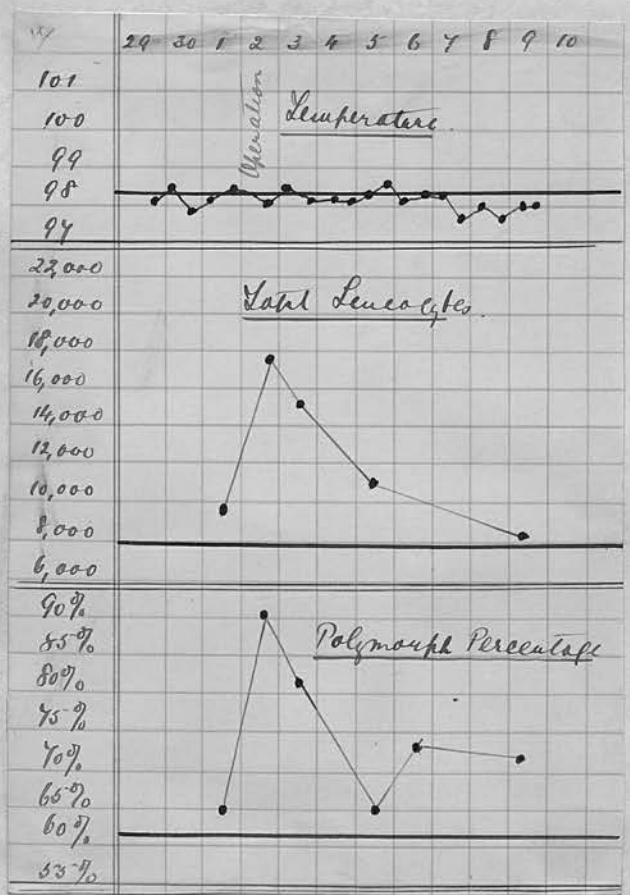
THE CURVES,- are of special interest as the Temperature curve shews no variation while both the Total Leucocyte and the percentage Polymorph shew a maximum rise on the 2nd and a gradual decrease till on the 5th the percentage polymorph is at normal; but the total is still up: then a slight rebound of the polymorph curve & sinking of the total leucocyte curve.

BLOOD EXAMINATION & PROPORTIONAL COUNT.

	REDS.	W.	POLY.	S.M.	L.M.	T.	E.
1.12 12 N.	4250000	9800	65.5	28	4	1	1.5
2.12 4 pm	4100000	17600	90.5	7	1.5	-	1
3.12 12 N.	-	15200	81.5	11.5	4.5	1.5	1
5.12 12 N.	4700000	11000	65	27	4	1	3
6.12 4 pm	-	-	73	22	2	1	2
9.12 4 pm	-	8400	72	25	3	0	0

GLYCOGEN REACTION & ABSOLUTE COUNT.

	TOTAL	POLY.	S.M.	L.M.	T.	E.	
1.	9800	6419	2744	392	98	147	negative
2.	17600	15928	1232	264	-	176	very faint positive
3.	15200	12388	1748	684	228	152	" " "
5.	11000	7150	2970	440	110	330	negative
9.	8400	6048	2100	252	0	0	very faint positive



CASE 5. M. M. male aged 8, admitted to the Royal Infirmary suffering from Congenital Inguinal Hernia. Patient was a bright sensible boy and was rather poorly developed for his age. Radical Cure was performed on Decr. 23rd, the operation lasting 40 minutes. The anaesthetics used were (1) Chloroform 2 drams & (2) mixture of Chloroform and Ether 4 drams. Patient made an excellent recovery & did not suffer any ill effects from the anaesthetic.

NOTES on TEMPERATURE. This was another case where there was scarcely any rise of temperature the maximum reached being 98.8° the morning after the operation.

BLOOD. The Leucocytes reached their maximum 4 hours after operation, having exactly doubled in number. The percentage of polymorphs rose to 79% an increase of 29%; the absolute count shews that they more than trebled in number. The leucocytosis rapidly fell & 28 hours after operation was down to 10,600, and the polymorphs reached their minimum percentage. In the mononucleated leucocytes, we again note a marked decrease in the small ones, while the large mononucleateds & transitionals which can be classed together, shew for the first 28 hours a marked increase, seen both in relative and absolute count. The Eosinophiles decreased/

decreased when the polymorphs were increased.

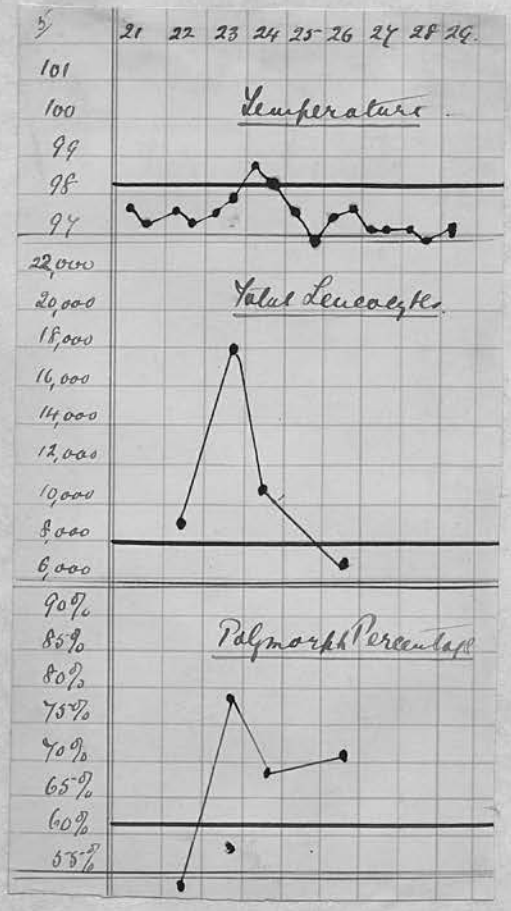
THE CURVES shew that in the afternoon of the operation the temperature curve is practically at normal, while both total leucocyte and percentage polymorph curves are at their maximum, and next day when temperature curve is at its maximum both the others have markedly fallen. The temperature curve, however, resumes normal before the others do; the percentage polymorphs remaining up the longest.

BLOOD EXAMINATION & PROPORTIONAL COUNT.

		L.	POLY.	S.M.	L.M.	T.	E.
22.12	1 pm	9000	50	40	5.25	0.75	4
23.12	4 pm	18000	79	16	3.5	1	0.5
24.12	1 pm	10600	68.5	18.5	10.75	2	0.25
26.12	1 pm	7000	70.5	19.5	7	1	2

GLYCOGEN REACTION & ABSOLUTE COUNT.

	L.	POLY.	S.M.	L.M.	T.	E.	
22	9000	4500	3600	472	68	360	negative
23	18000	14220	2880	630	180	90	"
24	10600	7261	1961	1140	212	26	"
26	7000	4935	1365	490	70	140	"



CASE 6. H.S. (male) aged 36, was readmitted to the Royal Infirmary for operation for Inguinal Hernia on left side and undescended testicle (two months previously patient had been operated on for Appendicitis and Inguinal Hernia on right side (see Case 9). Patient was a well built and healthy man. The operation was on the 14th Febr. and patient was anaesthetised for about an hour, Chloroform being used. Patient was rather uncomfortable after operation and was slightly sick for a few hours. Then he made an excellent recovery.

NOTES on TEMPERATURE. The night previous to the operation temperature was 98.8°, after operation it rose to same height, then on next day to 99.2° its maximum, and fell next morning to normal and remained about there.

BLOOD.

(a) Red Blood Corpuscles shew a slight decrease of 300,000 after operation (28 hours) while four hours after they were practically stationary.

(b) The Haemoglobin shews no variation, remaining steadily at 90%.

(c) Leucocytes. The leucocytes four hours after operation shew a large increase of over 12,000, reaching 20,400 maximum; at the same time the percentage of polymorphs increased to 92%. Then there was a rapid fall in the next 24 hours, and both the total leucocytes/

leucocytes and the percentage of polymorphs remained slightly above normal for a few days.

The Small Mononucleateds immediately following operation shew a great diminution both in relative and absolute counts. The other point of interest is that while Eosinophiles were seen only on two occasions out of the 6 on which a full differential count was done, mast cells were seen on 5 occasions reaching as high as 1%.

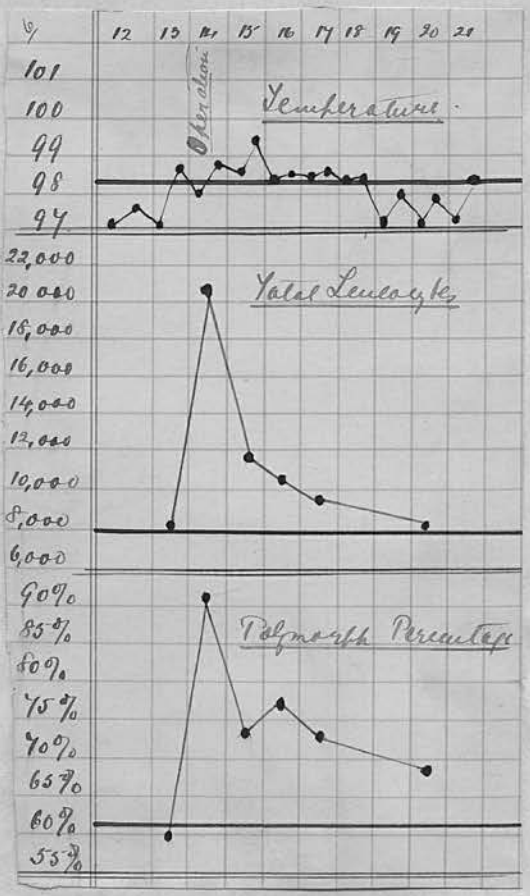
THE CURVES- again shew the maximum rise of temperature 99.4° to take place 24 hours later than the maximum rise of total leucocytes and percentage polymorphs, also the temperature curve returns to normal the soonest.

BLOOD EXAMINATION & PROPORTIONAL COUNT.

	PM.	R.	%	L.	POLY.	S.M.	L.M.	T.	E.	M.
13.2	4	4800000	90	8200	60	3.4	5	0.25	0.25	0.5
14.2	4	4820000	90	20400	92	5.25	2	-	-	0.75
15.2	4	4500000	90	11600	73.75	21	4	1	-	0 25
16.2	1	-	-	10600	77.5	18	4	-	-	-
17.2	1	-	-	9800	73	19	7	0.75	-	0.25
20.2	1	-	-	8600	69	27	1.5	0.5	1	1

GLYCOGEN REACTION & ABSOLUTE COUNT.

	TOTAL	POLY.					
13	8200	4920	2788	410	20	20	42 negative
14	20400	18768	1071	408	-	-	153 on each
15	11600	8555	2436	464	116	-	29 occasion
16	10600	8215	1908	477	-	-	-
17	9800	7154	1862	686	73	-	25
20	8600	5934	2322	129	43	86	86



S U M M A R Y O F R E S U L T S

of

HERNIA GROUP OF CASES (6 cases).

THE TEMPERATURE. The average of the maximum recorded was 99.4°. The maximun was on

1st day after operation in 3 cases
2nd " " " in 2 cases.

In one case the temperature did not rise above normal, and in one case the maximum was 100.4°. The temperature returned to normal on

1st day after operation in 1 case
2nd " " " in 1 case
3rd " " " in 2 cases
5th " " " in 1 case.

The time the temperature was above normal averaged 2 days.

THE BLOOD.

The Leucocytes averaged

prior to operation 8,800
maximum after operation 17,000
Gain 8,200.

The lowest maximum being 14,000; the highest 20,400. The maximum was reached on day of operation in 4 cases and on day after in 2 cases. The average number of days before they returned to normal was 4; the earliest being on the 2nd day and the latest on the 6th day.

THE/

THE POLYMORPHS averaged

prior to operation 62%
(maximum) after " 82%
Average increase 20%

The lowest maximum being 69.5%; the highest 92%. On 4 occasions the maximum was reached on day of operation, and on 2 on the day after operation. The average time before they returned to normal was 3 days, the shortest being 1 day and the longest 6 days.

THE SMALL MONONUCLEATEDS decrease markedly, relatively in each case, the greatest decrease being noted

on day of operation in 2 cases
on 1st " after " in 2 cases
on 2nd " " " in 2 cases

while in one case there was a slight rise in absolute numbers.

THE LARGE MONONUCLEATEDS were increased in each case,

the maximum in 1 case on day of operation
in 2 " on " after "
in 2 " two " " "
in 1 " three" " "

THE EOSINOPHILES were decreased in 5 out of 6 cases after operation. In the sixth there were none found prior to operation.

A P P E N D I C I T I S S E R I E S.

CASE 7. S. G. age 25 (male) had been troubled with recurrent attacks of Appendicitis for some years past. The last one was 2 or 3 weeks previous to operation. Patient was fairly well developed and had been otherwise in good health. Appendectomy was performed under Chloroform anaesthaesia. There was no pus but as there were a good many adhesions which had to be broken down, a drainage tube was put in; this was removed at the end of 48 hours. The operation lasted nearly 75 minutes. Patient was slightly uncomfortable till the tube was removed, but was not sick. He made an uninterrupted recovery, wound healing by first intention.

NOTES ON TEMPERATURE. Two days before operation temperature had been 99°. After the operation it reached its maximum 99.2° on 2nd day, then settled down practically on the normal level.

BLOOD. The Red Blood Corpuscles shew slight variation. On the 1st, 2nd & 3rd day after operation they were slightly increased & then on the 6th & 7th day they were decreased.

THE/

THE LEUCOCYTES 4 hours after operation had increased to nearly three times their standard. The polymorph percentage showing one of the largest increases 34%, and an increase in the absolute count of 4½ times. The leucocytes here lasted up till the 6th day after operation, and the polymorph percentage was distinctly high till the 6th day, and on the 7th day was much lower, but had by no means returned to its former normal.

The Small Mononucleated cells were rather variable, falling rapidly on day of operation, and then swinging as regards their absolute count, although steadily returning to the normal as regards their percentage. The Large Mononucleated cells show a marked increase all through, although tending to return to their normal proportions, towards the end of operations; but they were present in their greatest number on day of, and day following operation. On the other hand transitional cells were practically never found, and there were very few Eosinophiles: these cells disappeared absolutely when the polymorphs were so much increased.

This case is of interest as there were a good many adhesions, and as it was drained, these are probably the factors that caused the total leucocyte count and the percentage of Polymorphs to remain high.

COMPARISON/

COMPARISON OF THE CURVES.

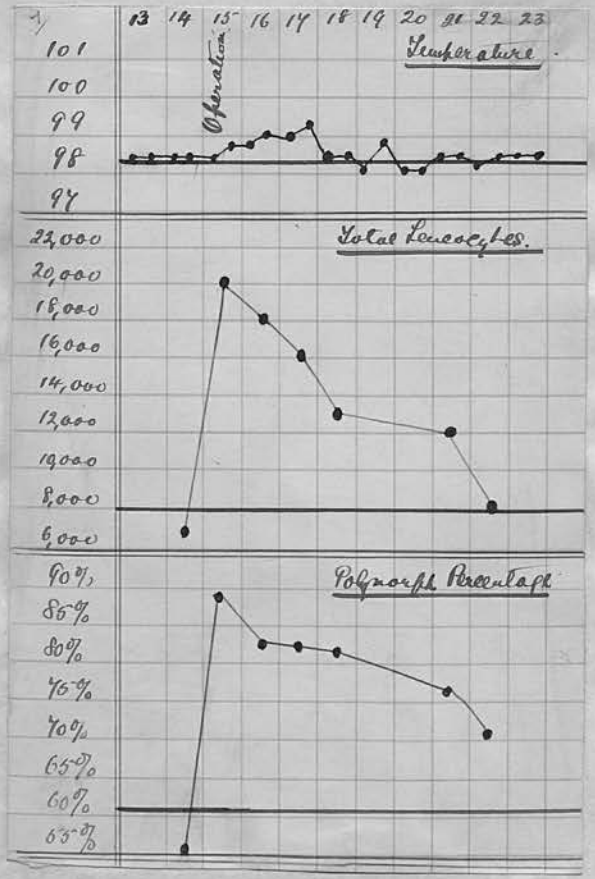
The temperature curve mounted very slightly on day of operation which showed the maximum point of the Total Leucocyte and percentage polymorph curves. Then on 2nd day after operation the temperature curve was at its maximum, while the other two were well on their way downwards; however, once again the temperature settled to its normal level some time before the other curves came down.

BLOOD EXAMINATION & PROPORTIONAL LEUCOCYTE COUNT.

Novr.	RED.	L.	POLY.	S.M.	L.M.	T	E.
14 12N	4900000	7000	54.5	39	5.75	-	0.75.
15 4Pm.	4800000	20000	88.5	6.5	5. 0	-	- --
16 4 "	5000000	18000	82.5	11.25	6.25	-	- --
17 12N.	5200000	16000	82.5	12.5	4. 5	-	0.5
18 4Pm.	5200000	13000	82.0	12.0	6.00	-	- --
21 12N.	4800000	12000	77.0	14.5	7. 5	-	1.00
22 4Pm.	4600000	8000	71.5	18.5	7.5	1	1.5.

GLYCOGEN REACTION & ABSOLUTE COUNT.

	TOTAL	POLY.	M.	S.M.	L.M.	T.	E.	
14.	7000	3815	2730		402	-	53	Negative
15	20000	17700	1300		1000	-	-	
16	18000	14850	2025		1125	-	-	
17	16000	13200	2000		720	-	80	Faint positive.
18	13000	10660	1560		780	-	-	
21	12000	9240	1740		900	-	120	Very faint positive
22	8000	5720	1480	80	600		120	" " "



CASE 8. A.Mac. male aged 29, had been troubled with severe attacks of pain in the Right Iliac region. For some time previous to operation, however, it had been quiescent. Patient was strong and healthy otherwise. Appendectomy was performed. Chloroform and Ether Mixture was the anaesthetic employed.
Patient made an excellent recovery, wound having healed by first intention with no discomfort.
NOTES ON TEMPERATURE. The temperature rose on the evening of the operation to 99.4 ; but fell next morning to normal, and remained slightly subnormal thereafter.
BLOOD. The Red Blood Corpuscles four hours after show a slight decrease, but by the next day this was absent; and thereafter they were normal in number.
LEUCOCYTES, before operation show a large proportion of Large Mononucleated cells and four hours after operation the Polymorph percentage had reached 93%, - one of the highest recorded in these observations. It soon fell, however, and on third day after operation it was at its own standard, while the next day it had fallen still more.

The Large Mononucleateds, although in percentage they never came up to the first count, still in absolute numbers, on day after operation, considerably exceeded their first number.

The other points of interest were (1) The large/

large numbers of Eosinophiles found on the fourth day after operation, and (2) the fact that mast cells were only seen on one day, and then amounted to 1%.

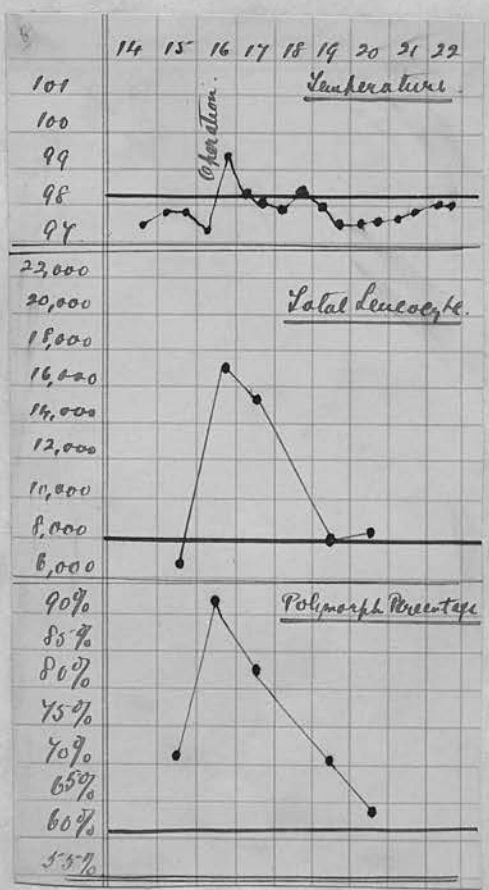
The curves are of interest, as this is the first occasion on which the three curves, temperature, total leucocyte, and polymorph percentage all reach their maximum on day of operation. The temperature curve, however, more quickly resumed the ordinary level.

BLOOD EXAMINATION & PROPORTIONAL COUNT.

	RED	L.	POLY.	S.M.	L.M.	T.	E.	M.
15.12 1 Pm.	5000000	6600	72	16	11	-	1	-
16.12 4 Pm.	4850000	16800	93	3	3	1	-	-
17.12 1 Pm.	5000000	15400	82	11	6	1	-	-
19.12 1 Pm.	5000000	8000	71	18	9	-	1	1
20.12 4 Pm.	5000000	8200	63.5	25.5	6.5	1.5	3	1

GLYCOGEN REACTION & ABSOLUTE COUNT.

	TOTAL	POLY.	S.M.	L.M.	T.	E.	M.	
15	6600	4752	1056	726		66	-	negative
16	16800	15624	504	504	168	-	-	"
17	15400	12628	1694	924	154	-	-	"
19	8000	5680	1440	720	-	80	80	"
20	8200	5207	2091	533	123	246	-	"



CASE 9 H.S. aged 30 was admitted suffering from double Inguinal Hernia, undescended testicle on left side and slight attacks of pain in the right Iliac region, as these were quiescent it was decided in the first place to deal with the appendix and the right hernia and then to operate on the left side (see Case 6 in Hernia Series). Patient was a strong well developed man in good general health. Appendectomy and the first Radical Cure were performed on the 27th Decr., patient being anaesthetised with Chloroform for about 90 minutes. Patient was very restless after operation and slightly sick, but soon recovering from that, his progress was uninterrupted, both wounds healing by first intention.

NOTES ON TEMPERATURE. On the evening of operation temperature rose slightly, but it reached its maximum on the following evening, 100°, and on the 2nd day after operation it was again slightly above normal 99.6°; but next day it again fell to normal and remained slightly subnormal for most of the time after this.

BLOOD. Leucocytes. The count 4 hours after operation was one of the largest recorded, and the polymorphs were found to have increased to almost five times/

times their former number. On day after operation, however, they had fallen greatly and on 3rd day after operation they were found to have returned to normal.

The SMALL MONONUCLEATED CELLS shew a slight increase in the absolute count on each day, while the LARGE MONONUCLEATEDS which were much increased 4 hours after operation, dropped a good deal the next day, and then were found to be increased to the last count. Only one Mast Cell was seen in the whole series, that was in the last count.

THE CURVES, again shew the polymorph percentage and total leucocyte count at their maximum on day of operation while the temperature reached its maximum on day following. In this case, however, all the three curves return to their normal on the same day.

As this patient was the only one who was operated on twice in this series of observations, it is interesting to contrast the after records. This operation was certainly more serious than the 2nd one (No.6).

TEMPERATURE. The maximum was reached on day after operation in both cases, 100^{o} in this as against 99.4^{o} in No. 6, but in No. 6 the temperature returned/

returned to normal on the 2nd day as against the 3rd here.

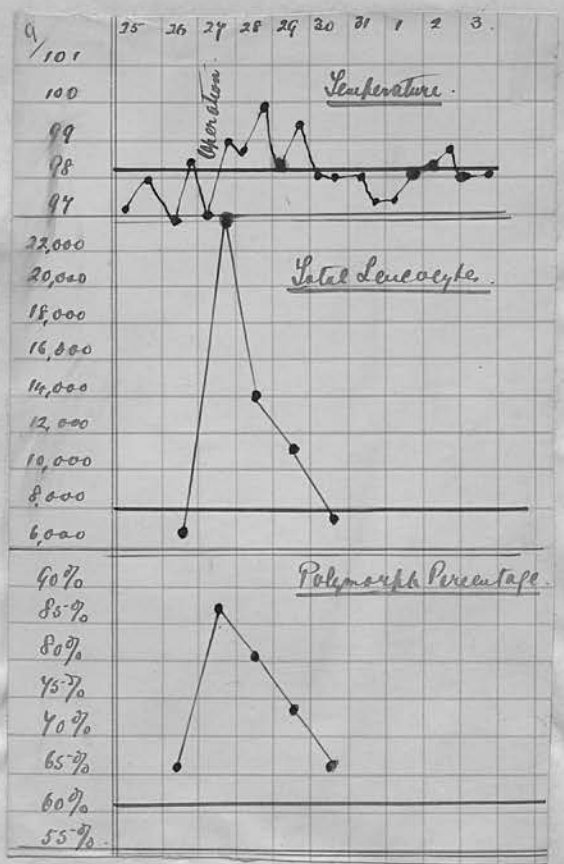
In this case too, the blood recorded an increase of nearly 18,000 leucocytes while No. 6 shewed an increase of 12,000. The polymorph percentage was not quite so great, however. In this case the SMALL MONONUCLEATEDS do not shew an absolute decrease while in No. 6 they were decreased all through, especially on day of operation.

BLOOD EXAMINATION & DIFFERENTIAL COUNT.

		L.	POLY.	S.M. L.	T.	E.
26.12	1 Pm.	6600	66.5	27 4.5	1.25	0.75
27.12	4 Pm.	24400	87	8.5 3	1.5	-
28.12	1 Pm.	14000	80	17 2	1	-
29.12	1 Pm.	11000	73.75	18 5.5	2	0.75
30.12	4 Pm.	7600	66	28 5.25	0.5	0.25

ABSOLUTE COUNT & GLYCOGEN REACTION.

26	6600	4389	1782	297 83	49	negative
27	24400	21228	2074	732 366	-	very faint positive
28	14000	11200	2380	280 140	-	negative
29	11000	8112	1980	605 220	83	very faint positive
30	7600	5006	1988	399 38	19	very faint positive



CASE 10. J. C. aged 25 was admitted to the Royal Infirmary after remittent attacks of Appendicitis. Patient was tall, fine, healthy and well developed; last attack had been 2 or 3 weeks previously. Appendectomy was performed, Chloroform being used for about 45 minutes; patient recovered well from the operation and wound appeared to heal by first intention. After about the 15th day patient complained of a good deal of pain about the wound. A superficial abscess was found & drained & in two days a deep abscess was opened, from which pure culture of Bacillus Coli was got. The wound was then drained for a few days and then closed up gradually.
NOTES ON TEMPERATURE. On night of operation temperature rose to 99.4° & then on day following operation it reached its maximum of 99.6°. On 2nd day after operation it was 99.4° and then came down to normal & remained about the normal line.
THE BLOOD. The Leucocytes rose 4 hours after operation to their maximum, as did the polymorphs both in percentage and absolute numbers. Both the total leucocytes and the polymorphs fell rapidly and by the 3rd day after operation were down to the normal.

The/

The SMALL MONONUCLEATED cells again shew a marked decrease in the percentage tables, and a slight one in the absolute tables, recovering to their normal by the 3rd day. THE LARGE MONUCLEATEDS and TRANSITIONALS all through were much increased; this was most marked the third day after operation. The EOSINOPHILES were decreased day of operation and then were absent for two days, but on third day were considerably in excess of former numbers.

NOTES ON THE CURVES. As in most cases the total leucocyte and polymorph percentage reached their maximum four hours after operation while the temperature curve did so on day after operation. On the third day after operation all the three curves were down again at normal.

The interest of this case is in the fact that some days after the wound had healed and the stitches were removed, the patient had pain and slight tenderness. The wound was opened up and a small quantity of serous fluid was found. As patient still had a good deal of pain, it was probed thoroughly and a deep abscess of foetid pus was found from which a pure culture of Bacillus Communis Coli was grown. It appeared as if at the operation there had been some infection of the surrounding part by the Bac. Coli which had caused no reaction of temperature, polymorph percentage or total leucocyte count for/

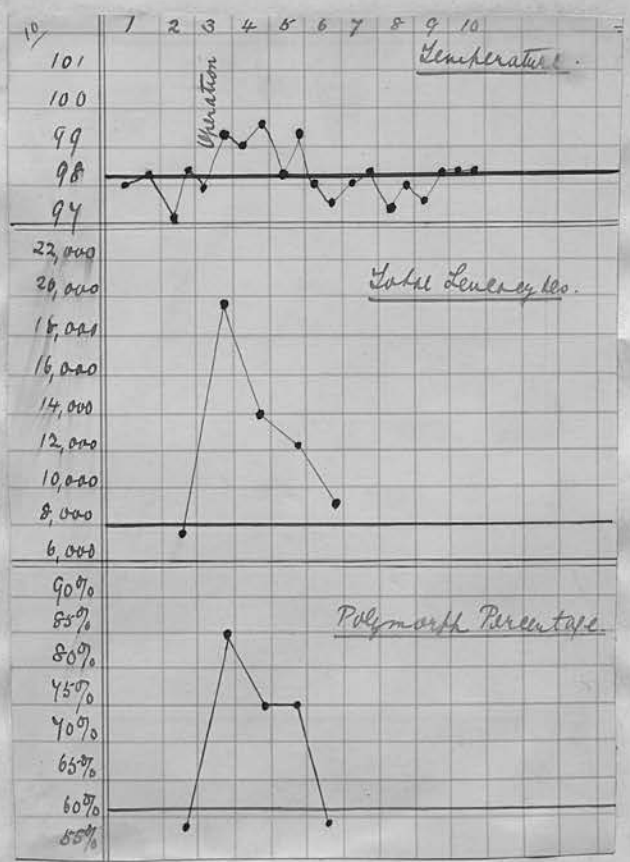
for over a fortnight after the operation. If the organism found had been any other than the Bacillus Coli, it would have probably been infected at some dressing.

BLOOD EXAMINATION & PERCENTAGE COUNT.

		L.	POLY.	S.M.	L.M.	T.	E.
2.1	1 Pm.	7400	57	38	3	0.5	1.5
3.1	4 Pm.	19500	84.5	12.5	2	0.5	0.5
4.1	4 Pm.	14000	75	21	3	1	-
5.1	1 Pm.	12200	75	21.5	2.25	1.25	-
6.1	4 Pm.	9400	57	34	5.5	1	2.5

GLYCOGEN REACTION & ABSOLUTE COUNT.

2	7400	4218	2812	222	37	111 negative
3	19500	16477	2437	390	98	98 very faint positive
4	14000	10500	2940	420	140	0 faint positive
5	12200	9150	2623	274	153	0 very faint positive
6	9400	5358	3196	517	94	235 " " "



CASE 11. A. R. male, age 19, was admitted to Chalmers Hospital, suffering from recurrent Appendicitis. Patient was otherwise healthy. Appendectomy was performed under Chloroform Anaesthaesia which lasted about 35 minutes. Patient was slightly sick after the operation, but made an excellent recovery, wound healing by first intention.

NOTES ON TEMPERATURE. The temperature rose to 99.2° on evening of operation, coming back to normal next day & remaining slightly subnormal thereafter.

THE BLOOD. The leucocytes reached their maximum on the evening of the operation as did the polymorph percentage, which, however, continued there till the 2nd day after operation, while the total leucocytes had fallen considerably by the 2nd day, and on the 3rd day were practically at normal. THE SMALL MONONUCLEATEDS decreased after operation, especially on the 2nd day, while the LARGE MONONUCLEATEDS were increased. EOSINOPHILES were not seen on the day of and 2 days after operation. Mast Cells were seen on one occasion (the third day).

THE CURVES shew the three at their maximum together on the evening of the operation, but the temperature curve/

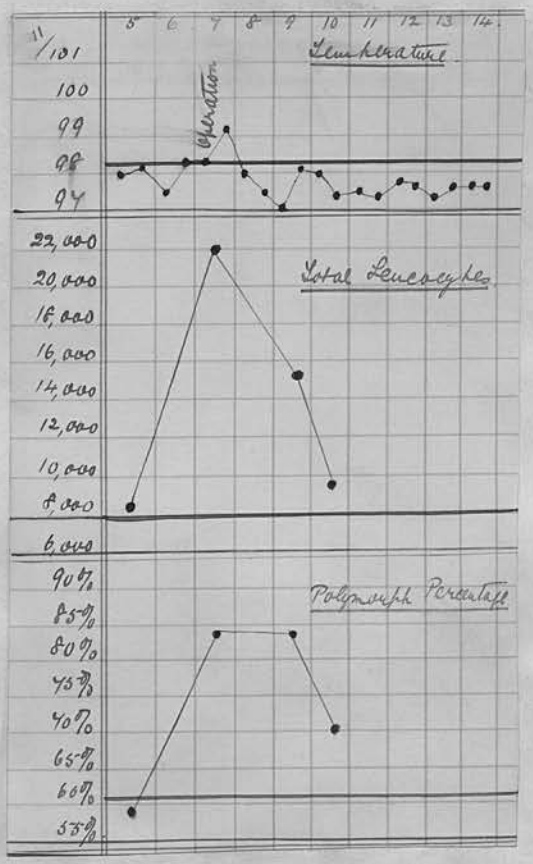
curve returned to normal the day after operation while the total leucocyte curve and the polymorph percentage curve did so on the third day after operation.

BLOOD EXAMINATION & DIFFERENTIAL PERCENTAGE.

		L.	POLY.	S.M.	L.M.	T.	E.	M.
5.1	4 Pm.	8500	58.5	37	3	0.75	0.75	-
7.1	11 Am.	Operation						
7.1	8 Pm.	22000	83	13	4	-	-	-
9.1	2 Pm.	15400	83	11.5	5	0.5	-	-
10.1	2 Pm.	9800	70	23	5	0.5	0.5	1

GLYCOGEN REACTION & ABSOLUTE DIFFERENTIAL.

5	8500	4972	3145	255	64	64	negative
7	22000	18260	2860	880	-	-	"
9	15400	12782	1771	770	77	-	faint positive
10	9800	6860	2254	490	49	49	98 negative



CASE 12. E. S. female, aged 26, was admitted to the Royal Infirmary with a history of Appendicitis; after being kept under observation for a month, Appendectomy was performed, Chloroform being administered for about 50 minutes. Patient was well developed and appeared to have good general health. After operation patient made an excellent recovery but prior to dismissal she complained of pain in right Iliac Fossa again; at the same time there was a slight rise of temperature. Patient was again put back to bed and in 2 or 3 days she was all right once more.

NOTES ON TEMPERATURE. On the third day before operation temperature was 99.2°, then on morning of operation it was 98.6° but fell to 97.4° after rising next evening to its maximum 99°. After this it did not rise above normal except on 3rd day after operation when it reached 98.6°.

BLOOD. The Leucocytes. The maximum of the leucocytes was noted 3 hours after operation, while the polymorph percentage reached its height 24 hours after operation. They had both returned to normal by the 3rd day.

The SMALL MONONUCLEATEDS before the operation were 52½% of the total, far exceeding the polymorphs, but as usual they dropped very much on day of and also day after operation, increasing to 38% on 3rd day/

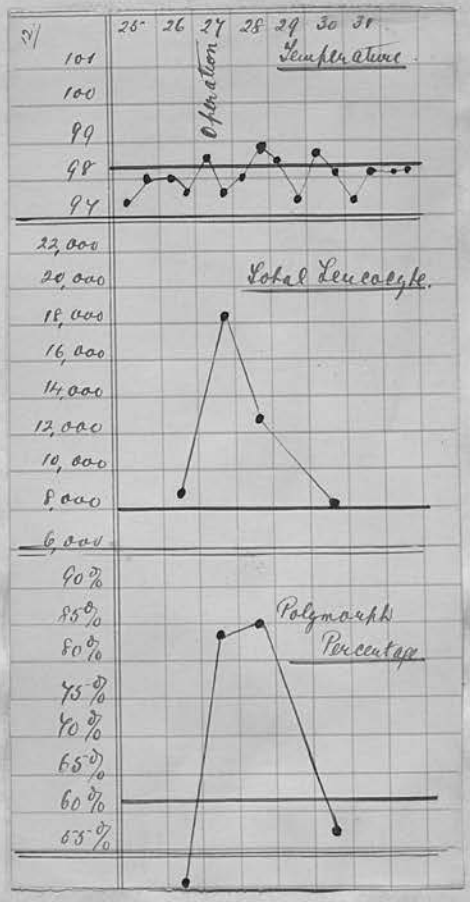
day after operation. THE LARGE MONONUCLEATEDS shew a great increase immediately after operation which was maintained. The Mast Cells also give the very large count of 182 per c.m. on day of operation.

BLOOD EXAMINATION & PERCENTAGE COUNTS.

	L.	POLY.	S.M.	L.M.	T.	E.	M.
26.1 1 Pm.	9000	45.5	52.5	1	0.25	0.5	0.25
27.1 3 Pm.	18200	83.5	11	3.5	-	1	1
28.1 12 Pm.	12600	85.5	11	3	0.25		0.25
30.1 3 Pm.	8000	58	38	2	0.25	1.5	0.25

GLYCOGEN REACTION & ABSOLUTE COUNT.

26	9000	4095	4725	90	23	44	23	negative
27	18200	15197	2002	637	-	182	182	"
28	12600	10772	1386	378	32	-	32	"
29	8000	4640	3040	160	20	120	20	"



CASE 13 C.M. aged 19 suffering from recurrent Appendicitis was admitted to the Royal Infirmary. She was rather chlorotic but was in fairly good general health. Appendectomy was performed. Ethyl Chloride was first administered and then a mixture of Chloroform and Ether for 75 minutes. She was slightly sick just after the operation but made an excellent recovery.

NOTES ON TEMPERATURE. This was another case which shewed no trace of the traumatic fever. For two days previous to operation, the temperature had been slightly subnormal, then on the evening after operation, the maximum was reached - 98.6°, then there was a drop to 98.4° next day, and on 2nd day after operation a further drop to 98°; the temperature remained about 98° thereafter.

THE BLOOD Leucocytes before operation were rather low in number. Between 3 & 4 hours after the operation they had increased to 3 times their former number, and the percentage of polymorphs had also greatly increased, while in absolute count the polymorphs were nearly 5 times as great. By next day however, both the total leucocytes and the polymorphs had greatly decreased, and although on 2nd day after operation/

operation they had not quite reached their normal, they were nearly down to ordinary proportions. THE SMALL MONONUCLEATEDS while much reduced in proportion, varied very little in absolute numbers. THE LARGE MONONUCLEATEDS on the other hand were greatly increased. THE EOSINOPHILES were diminished when the polymorphs were in excess, while Mast Cells were present in 3 out of 4 counts.

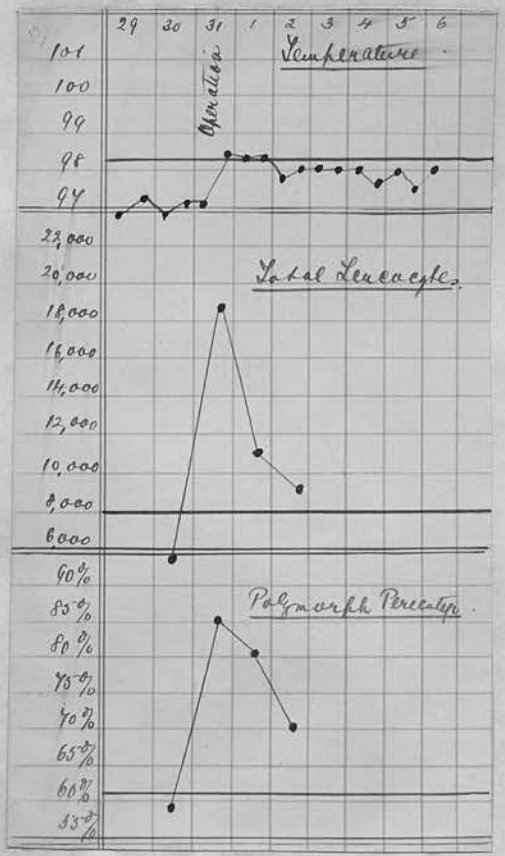
THE CURVES. In spite of there being no rise in temperature the leucocyte and polymorph percentage curves shew the ordinary rise & fall.

BLOOD EXAMINATION & PERCENTAGE COUNT.

		L.	POLY.	S.M.	L.M.	T.	E.	M.
30.1	1 Pm.	5600	59	35	3.5	1.25	1	0.25
31.1	11 Am.	Operation						
31.1	4 Pm.	18400	85	11	3	0.5	-	0.5
1.2	4 Pm.	11200	80.5	16.5	3	-	-	-
2.2	1 Pm.	9200	70	22	6.5	0.5	0.5	0.5

ABSOLUTE COUNT & GLYCOGENIC REACTION.

30	negative	5600	3304	1960	196	70	56	14
31	"	18400	15640	2024	552	92	-	92
1	"	11200	9016	1848	336	-	-	-
2	"	9200	6440	2024	548	46	46	46



CASE 14. D. P. (female) aged 25 was admitted to the Royal Infirmary suffering from Recurrent Appendicitis. Patient was a healthy & well formed woman in good general health. Appendectomy was performed under (1) Ethyl Chloride (2) Chloroform and Ether mixture ½ oz. The operation lasted 40 minutes. Patient made a good recovery, wound healing by first intention.

NOTES ON TEMPERATURE. This was another case where there was practically no traumatic fever. The temperature reached its maximum 99.° on the 2nd day after operation. It then came down and did not rise above normal again.

THE BLOOD. There are 2 preliminary counts as the operation was put off because patient was menstruating. Both of these preliminary counts are almost identical. The Leucocytes 3 hours after operation reached their maximum by an increase of 7,600 over previous count; this was the smallest increase noted in the Appendicitis cases, but the polymorph percentage was one of the largest.

THE SMALL MONONUCLEATEDS were greatly diminished all through especially in the first count after operation; even a week after the operation they had scarcely/

scarcely returned to the normal. THE LARGE MONONUCLEATEDS were again greatly increased on 1st and 2nd days after operation, while the EOSINOPHILES were completely absent on the first three days after operation and Mast Cells were found only on two occasions.

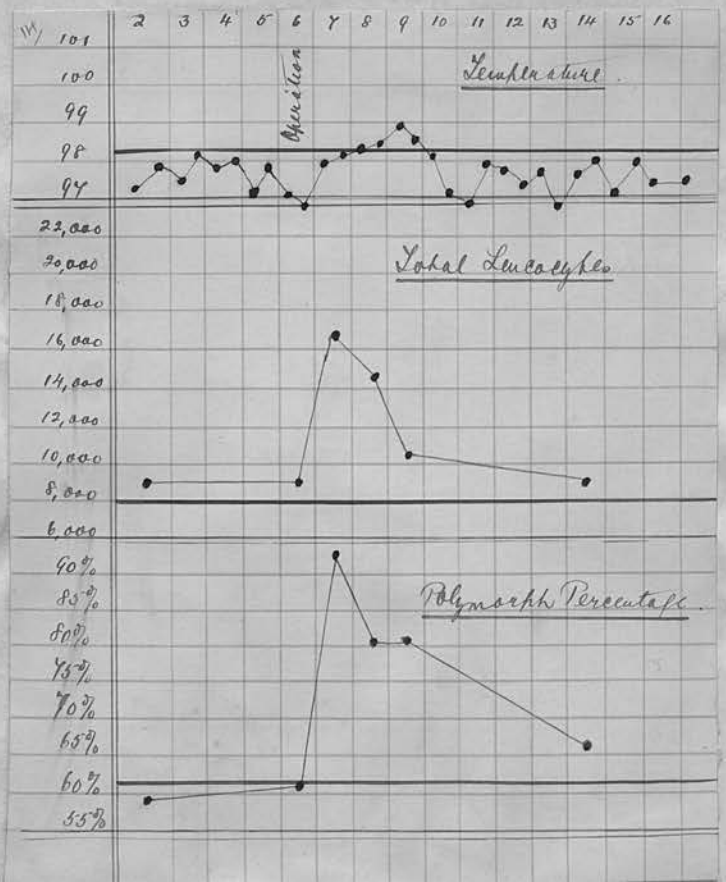
THE CURVES. Again we note that the total leucocyte and the polymorph percentage curves reach their maximum on day of operation, while the temperature was delayed till the 2nd day after operation. Here, however, we have a slight rebound of the polymorph percentage curve.

BLOOD EXAMINATION & PERCENTAGE COUNT.

		L.	P.	S.M.	L.M.	T.	E.	M.
2.2	3 Pm.	9200	59	38	2	0.25	0.75	-
6.2	12 Nn.	9000	61	35	2.5	-	1.5	-
7.2	11	Operation						
7.2	3 Pm.	16600	93	5.5	1.25	0.25	-	-
8.2	3 Pm.	14400	80	14.75	5	-	-	0.25
9.2	1 Pm.	10400	81	11	7	1	-	-
14.2	3 Pm.	9000	66	31	2	1	0.75	0.25

ABSOLUTE COUNT & GLYCOGEN REACTION.

2	9200	5428	3496	184	23	69	- negative
6	9000	5490	3150	225	-	135	- "
7	16600	15438	913	207	42	-	- v. faint positive
8	14400	11520	2124	720	-	-	36 negative
9	10400	8424	1144	728	104	-	- "
14	9000	5940	2790	180	-	67	23 v. faint positive



CASE 15. E. D. aged 19, female, admitted to the Royal Infirmary with a history of recurrent attacks of pain in the right Iliac fossa. Patient was otherwise in good health & was well developed. Appendectomy was performed which took one hour. Ethyl Chloride was first given & then Chloroform and Ether mixture, 3 oz being used. Patient was not sick after the operation and the wound healed by first intention.

NOTES ON TEMPERATURE. On only one occasion did the temperature exceed normal, i.e. on the 2nd day after operation 99.2°.

NOTES ON BLOOD.

A. The Red Blood Corpuscles were slightly increased 3 hours after operation; this was still present next day. There were no poikylocytosis or nucleated reds, and they stained well both before & after the operation.

B. The Haemoglobin did not appear to vary at all, being 85% on each occasion it was tested.

C. LEUCOCYTES. The total count & the polymorph percentage were greatly increased 3 hours after the operation. As usual there was a very marked drop the next day, but three days after the operation the total leucocytes were still above normal, while the polymorphs were quite down to normal 61%.

THE SMALL MONONUCLEATEDS were much diminished on first two counts after the operation. THE LARGE MONONUCLEATEDS were much increased after the operation/

operation in each count while the EOSINOPHILES were also considerably increased, on day after and three days after. Mast Cells were seen on three occasions.

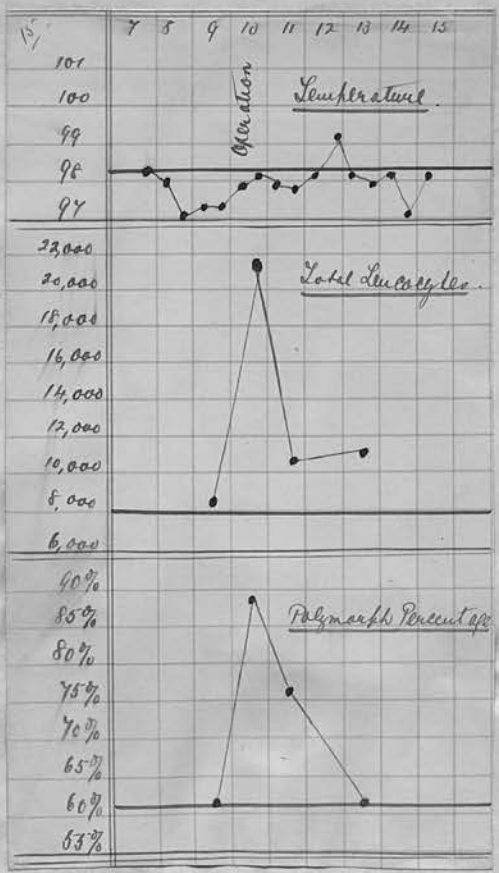
THE CURVES. As usual the temperature curve was the last to reach the maximum, and while the total leucocyte and polymorph percentage went up together, the polymorph percentage reached normal before the total leucocyte.

BLOOD EXAMINATION & DIFFERENTIAL PERCENTAGE.

		R.	M.	W.	P.	S.M.	L.M.	T.
9.2	3 Pm.	4450000	85%	8600	61	36.25	2	0.5
							E.0.25	M. -
10.2	11 Am.	Operation						
10.2	3 Pm.	4650000	85%	21600	88.5	8.5	36.25	0.5
							E.-	M.0.25
11.2	12 Nn.	4600000	85%	10600	76	16	6	0.5
							E.1.25	M.0.25
13.2	1 Pm.	-	-	11200	61	28.5	7	1.5
							E.1.5	M.0.5

ABSOLUTE COUNT & GLYCOGEN REACTION.

	W.	P.	S.M.	L.M.	T.	E.	M.	
9	8600	5246	3117	172	43	22	-	negative
10	21600	19116	1836	486	108	-	54	"
11	10600	8056	1696	636	53	133	26	"
13	11200	6832	3142	784	168	168	56	"



CASE 16. J. P. age 19 female, was admitted to the Royal Infirmary suffering from Recurrent Appendicitis. Patient was a healthy young woman. Appendectomy was performed under Chloroform, operation lasting about 45 minutes. Patient was not sick after operation & made an excellent recovery, the wound healing by first intention.

NOTES ON TEMPERATURE. The maximum 99.2° was reached on the day after operation, coming down next day to normal and remaining there.

THE BLOOD.

A. The Red Blood Corpuscles shew practically no change; a slight fall of 130,000 on the 2nd day after the operation.

B. The Haemoglobin also fell in practically the same proportion from 102% to 100%, but in both these cases the difference could easily be accounted for by the allowable variation.

C. The Leucocytes. With the exception of Case 37 where the patient died 30 hours after operation, this case shews much the largest rise in the total number of leucocytes, reaching 31,500; also in the absolute number of Polymorphs where there was an increase of nearly 23,000. Both these took place 3 hours after the operation and by the next day there was a marked fall. The polymorph percentage reached normal 3 days after operation, while the total number of leucocytes was down to normal on the 6th day.

THE/

THE SMALL MONONUCLEATEDS were decreased in percentage all through, and in absolute numbers the decrease was specially noticed on the 2nd day after operation, thereafter rising to practically the normal. THE LARGE MONONUCLEATEDS were not seen prior to the operation, but shewed a great increase 3 hours after operation. THE TRANSITIONALS were also greatly increased in the first four counts after operation. THE EOSINOPHILES were absent on day of and day after operation and were considerably increased by the last count, while the Mast Cells were variable.

THE CURVES. While we have the enormous rise in the total leucocyte curve, the temperature curve scarcely rises at all, reaching its maximum 99.2° the day after the two blood curves reach their maximum, & also returning to normal on the 2nd day after operation or the day before the polymorph percentage curve does, and 4 days before the total leucocyte curve does.

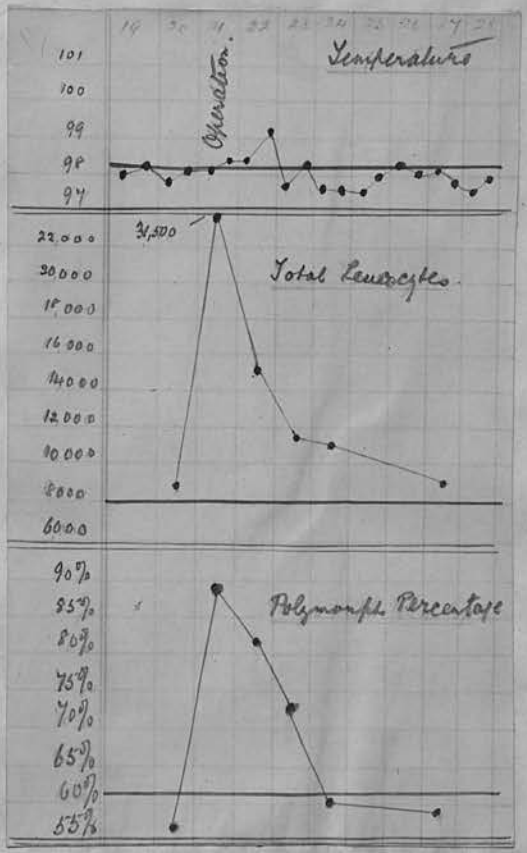
This case is of special interest shewing the great rise the leucocyte may make in a very short period where there is practically no difference in the concentration of the blood shewn by the Red count and the Haemoglobin estimation, and where there is no suggestion of sepsis.

BLOOD EXAMINATION & DIFFERENTIAL PERCENTAGE.

		REDS	H.%	L.	P.	S.M.	L.M.	T.	E.
20.2	1 Pm	5150000	102	9000	57	42	-	0.5	0.25 M.0.25
21.2	11 Am	Operation							
21.2	3 Pm	5140000	100	31500	89	7.25	3	0.5	- M.0.25
22.2	3 Pm	5040000	100	15200	82	13.5	3	1.5	- M. -
23.2	1 Pm	5020000	100	11700	73	16	7.5	2.5	0.25 M.0.75
24.2	3 Pm	-	-	11400	60	32.5	4	2	0.5 M.1
27.2	1 Pm	-	-	9000	59	35	4	0.75	1 M.0.25

GLYCOGEN REACTION & ABSOLUTE DIFFERENTIAL.

	LEU.	POLY.	S.M.	L.M.	T.	E.	M.	
20	9000	5130	3780	-	46	22	22	negative
21	31500	28035	2284	945	157	-	79	v. faint positive
22	15200	12464	2052	456	228	-	-	negative
23	11700	8541	1872	878	293	29	87	v. faint positive
24	11400	6840	3705	456	228	57	114	v. " "
27	9000	5310	3150	360	67	90	23	negative



S U M M A R Y OF R E S U L T S

of

GROUP OF APPENDICITIS CASES (10).

TEMPERATURE. The average of the maximums recorded was 99.3°.

This maximum was on day of operation in 3 cases
" " " "1st" after " " 4 "
" " " "2nd" " " " 3 "

The lowest maximum was 98.6° and the highest maximum 100°.

The Temperature returned to normal

on 1st day after operation in 3 cases
on 2nd " " " " 1 case
on 3rd " " " " 6 cases.

The time the temperature was above normal averaged 1.6 days.

THE BLOOD. The Leucocytes averaged

prior to operation 8,000
maximum after " 21,000
Gain 13000.

The lowest maximum recorded was 16,500
" highest " " " 31,500.

In each case the maximum was recorded on day of operation (average 4 hours after it). The average number of days before they returned to normal was 3.4; the earliest being on 1st day after and the latest on the 6th day after.

The/

The Polymorphs - averaged

prior to operation 58%
maximum after " 87%
Gain 29%.

The lowest maximum being 83%, and the highest being 93%.

In each case the maximum was recorded on day of operation (average 4 hours after it). The average number of days before they returned to normal was 3.7; the earliest being on the 3rd and the latest on the 6th day.

THE SMALL MONONUCLEATEDS, decrease markedly in each case in percentage, while in 3 cases out of the ten the absolute numbers remain about the same.

The maximum decrease was noted

in 7 cases on day of operation
in 2 " "1st" after "
in 1 case on 2nd " "

THE LARGE MONONUCLEATEDS were markedly increased in each case, especially in absolute numbers. The maximum increase was noted

in 4 cases on day of operation
in 5 " on " after "
in 1 case on 2nd " " "

THE EOSINOPHILES shew a decrease in each case & in most are absent on first 2 counts after operation.

C A R T I L A G E S E R I E S .

CASE 17. J.G. aged 31, was admitted to the Infirmary with a dislocated internal semilunar cartilage. Patient was alcoholic and not very well developed. The cartilage was excised under Ether 3 ozs. patient having first been anaesthetised with Ethyl Chloride. The operation lasted 40 minutes and the patient gave a great deal of trouble with struggling and difficulty of breathing.

PROGRESS. This case caused a great deal of anxiety as on the third day after operation the knee was distended and a large quantity of blood stained serum was removed. This again happened on the sixth day after operation. Cultures were taken several times: but on each occasion they were absolutely negative.

NOTES on the TEMPERATURE. For the first three days after operation, the maximum was 99.6° this was reached on the day of, and again on the day after operation. Then it gradually fell to normal and rose again on the fourth day and continued swinging for some time, gradually settling down.

THE BLOOD. A. Red Blood Corpuscles show a marked reduction in numbers from 5,000,000 to 4250,000: this is of interest, as the anaesthetic used was Ether. On the third day they had slightly increased once more./

more.

THE LEUCOCYTES at no time showed a marked increase, four hours after operation reaching only 13,000 while the maximum was reached next day, however, the largest polymorph percentage was recorded four hours after operation, 78%: this fell back to the normal next day.

The noticeable feature of this case was the Small Mononucleateds which increased slightly four hours after operation, and were almost double their original absolute number next day. The Large Mononucleateds on the other hand, decreased immediately after the operation, and next day returned to their normal, and at no time showed a marked increase.

THE EOSINOPHILES were variable.

THE CURVES, - show the Temperature curve and the Polymorph percentage curve attain their maximum before the total leucocyte curve. The polymorph curve, however, was the first to return to normal on day after operation, then the total leucocyte curve, and lastly the temperature, which, however, was simply swinging and not steady.

This case shows the value of blood examination after operation where there is any anxiety as to the progress, and further treatment. The temperature, and the suspicious appearance of the joint both pointed to a septic condition, but no growths were obtained/

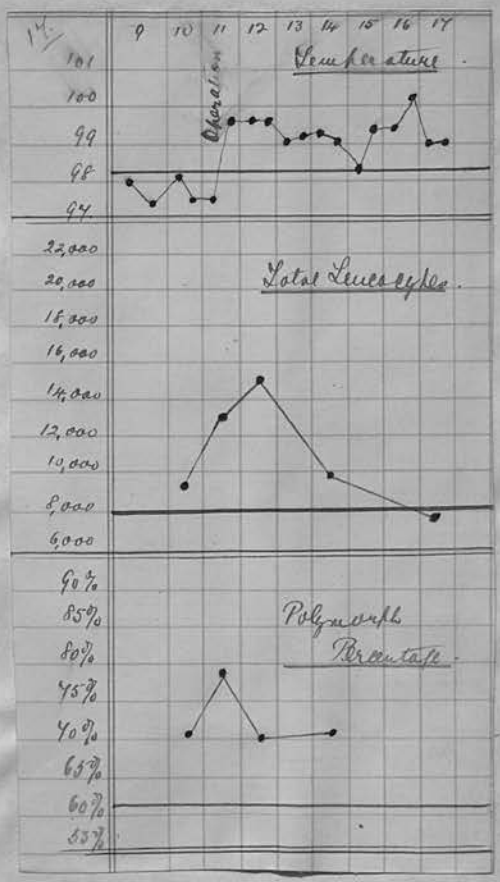
obtained on any of the cultures. Now the blood at no time gave any indication of a septic condition, in fact the changes recorded were never of a suspicious nature, there was the ordinary rise and fall of the leucocytes, although no great increase was noticed, also the percentage of the polymorph was never suggestive of pus: and in both cases, we have their return to normal quickly, and culture examination was also negative, - the wound also healed well in spite of effusion and pain.

BLOOD EXAMINATION & DIFFERENTIAL PERCENTAGE.

	R.	W.	POLY.	SM.	LM.	T.	E.
10.11 4Pm.	5000000	9600	71%	20	7	1	1
11.11 4 "	4500000	13000	78%	20	2	-	-
12.11.4 "	4250000	15000	70	25	4.5	-	0.5
14.11 12 N.	4500000	9700	71.5	20	7.5	1	-
17.11.12 N.	-	7500	-	-	-	-	-

ABSOLUTE COUNT & GLYCOGEN REACTION.

		POLY.	S.M.	L.M.	T.	E.	
10.	9600	6816	1920	672	96	96	Negative on
11.	13000	10140	2600	260	-	-	three occasions
12.	15000	10500	3750	675	-	75	
14.	9700	6935	1940	728	97	-	
17.	7500	-	-	-	-	-	



CASE 18. J.B. male aged 26, admitted with displaced internal semilunar cartilage. Patient was a strong well built man who appeared to be in good general health. The cartilage was excised under Chloroform anaesthaesia operation lasting about 35 minutes. Patient made an excellent recovery wound healing by 1st. intention.

NOTES on the TEMPERATURE. The maximum was reached on day of operation 99.4° and remained slightly below this figure till the 4th day after operation when it reached 98°.

BLOOD. The Red Blood Corpuscles show practically no change.

THE LEUCOCYTES reached their maximum 3 hours after operation as did the polymorphs. They both returned to normal fairly quickly although not so quickly as in the previous case.

THE SMALL MONONUCLEATEDS were much diminished both on day of and day after operation, returning to normal on 3rd day after operation.

THE LARGE MONONUCLEATEDS were diminished immediately after operation, but were markedly increased on subsequent counts. EOSINOPHILES were diminished in counts after operation and MAST CELLS were seen only on one occasion.

THE CURVES. All the three curves reach their maximum /

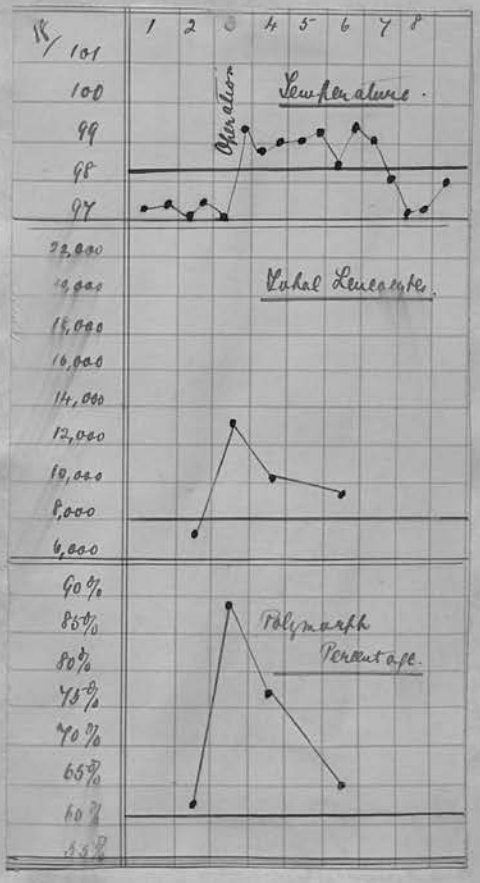
maximum on day of operation. The temperature curve then shewed a slight tendency to swing while the total LEUCOCYTE curve and the POLYMORPH percentage curve came down steadily.

BLOOD EXAMINATION & DIFFERENTIAL PERCENTAGE.

	R.	W.	POLY.	S.M.	L.M.	T.	E.	Mast.
2.2.3Pm.	4800000	7400	63.5	32	3	0.5	0.75	0.25
3.2.3Pm.	4600000	13000	88.5	9.5	1	1		
4.2.12Nn.	-	10400	77	15.5	6.25	1	0.25	
6.2.12Nn.	-	9600	65	30	3.5	1	0.5	

ABSOLUTE COUNT and GLYCOGEN REACTION.

	TOTAL	POLY.	S.M.	L.M.	T.	G.	M.	
2	7400	4699	2368	222	37	55	19	Negative
3	13000	11505	1235	130	130	-	-	Negative
4	10400	8008	1612	650	104	26	-	Negative
6	9600	6240	2880	336	96	48	-	Negative



CASE 19. J.B. aged 50 male. admitted to the Royal Infirmary with a dislocated internal semi-lunar cartilage. Patient was well built and healthy The cartilage was excised and a tube left in the joint. The anaesthetic, which was (1) Ethyl Chloride and then Chloroform and Ether mixture ($\frac{3}{4}$ hour) was badly borne and patient stopped breathing and artificial respiration was performed for several minutes. Patient had a good deal of pain in the knee, and on third day after operation a lot of clear fluid was allowed out, next day some blood stained fluid both of these gave negative cultures. Later on, however, out of several growths one colony of diplococcus was grown, all the others were sterile. After the tenth day, however, patient got more comfortable and wound began to heal up.

NOTES on the TEMPERATURE. The evening of the operation the temperature rose to 100.6° then came back to normal next day and on second day after operation it started to rise slowly and continued up with slight swingings till the eleventh day after operation.

THE BLOOD. The leucocytes before operation were 7,200 the polymorphs being only 40%. Three hours after operation each attained its maximum and then speedily came down on day after operation and on third day they were practically at normal although the/

the polymorphs had not reached their previous low-percentage.

The small Mononucleateds were slightly diminished and the large Mononucleateds were increased especially on third day after operation. The Eosinophiles were decreased after the operation while Mast Cells were present on three out of four counts.

THE CURVES, all the three curves reached their maximum on day of operation and on day after operation they were all practically at normal, then the temperature curve started to rise while the total leucocyte curve fell still more and the polymorph percentage curve remained about normal. This case is again of interest as it gave rise to a good deal of anxiety. There seems no doubt that it was slightly septic, although only one colony was obtained out of a series of cultures: unfortunately the blood examination was not carried out for more than three days after the operation, but by this time the temperature was up and some clear fluid had been removed from the joint. The blood gave no clue in fact it had returned to normal more quickly than usual, although considering the low count of polymorphs present before operation, the fact that the percentage remained at 60 was perhaps slightly suspicious./

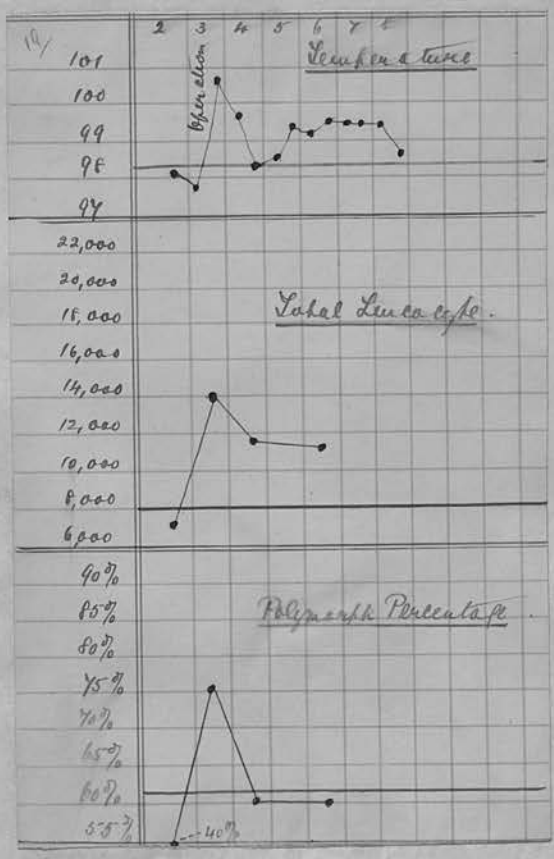
suspicious. It is difficult to draw deductions from such a case in spite of the fact that a tube was inserted, the blood was nearly at normal the day after operation, evidently, although the infection had taken place at time of operation, it must have been a very slight one judging from the culture results, some might regard the blood evidence in such a case as practically negative.

BLOOD EXAMINATION & DIFFERENTIAL PERCENTAGE.

	Leuc.	Poly.	S.M.	L.M.	T.	E.	M.
2.2.3Pm.	7,200	40.5	55.	2.25	-	2	0.25
3.2.3Pm.	14,000	75.5	21.75	1.75	0.25	0.5	0.25
4.2.12Nn.	9,800	60	37	2	0.25	0.25	0.5
6.2.12N.	9,600	60	35.5	3.5	0.75	0.25	

ABSOLUTE COUNT and GLYCOGEN REACTION.

	Leuc.	Poly.	S.M.	L.M.	T.	E.	M.	
2	7,200	2,916	3960	162	-	144	18	Negative
3	14,000	10,570	3045	245	35	70	35	Negative
4	9,800	5,880	3626	196	24	25	49	Negative
6	9,600	5,760	3408	336	72	24	-	Negative



CASE 20. L. aged 17, was admitted to the Infirmary with an undescended testicle. Patient looked rather an unhealthy boy. He was operated on under Chloroform, the testicle being freed was brought down (about 35 minutes.) Patient made a good recovery, the wound healing by first intention.

NOTES on the TEMPERATURE. The maximum was reached on the first and second days after operation 100°, then it came down to normal and remained at or below the normal line.

THE BLOOD. The Leucocytes reached their total maximum on day after operation, as did the absolute number of the Polymorphs, while the percentage was at its highest four hours after operation. On the sixth day after operation, the Polymorph fell as low as 42%. The Small Mononucleateds decreased slightly in absolute numbers four hours after the operation, but next day had reached the normal. The Large Mononucleateds were greatly increased till the fourth day after operation. The Eosinophiles disappeared for the first two counts after operation, and then slightly increased on previous total.

THE CURVES. The Polymorph percentage curve reached its maximum four hours after operation, while the temperature curve and total leucocyte curve were delayed till the day after operation. The temperature continued/

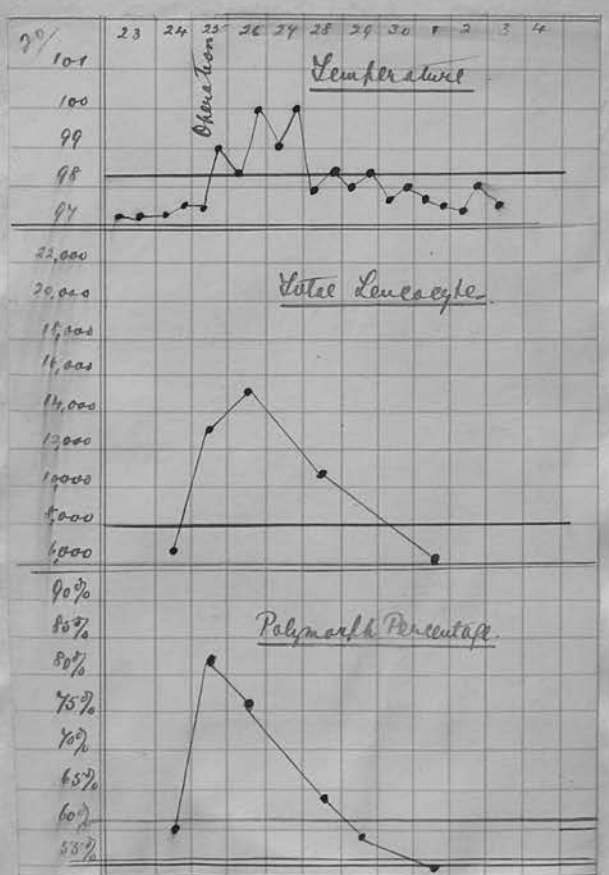
continued fairly high next day, while the others were well down. All three, however, reached the normal about the same time.

BLOOD EXAMINATION & DIFFERENTIAL PERCENTAGE.

	LEUCOCYTES.	POLY.	S.M.	L.M.	T.	E.
24.11.Nn.	6600	60.5	31.5	6	1.5	0.5
25. 4.PM.	13000	82	10.5	6	1.5	-
26 Nn.	15000	76.5	13.5	10	-	-
28. 4.Pm.	10600	64	21.5	11.5	2.5	0.5
29. 4.Pm.	-	58.5	30.5	9.5	1	0.5
1.12.4Pm.	6000	42	50	5	1	2

ABSOLUTE DIFFERENTIAL and GLYCOGEN REACTION.

	TOTAL	POLY	S.M.	L.M.	S.	E.	
24	6600	3993	2079	396	99	33	NEGATIVE.
25	13000	10660	1365	780	195	-	VERY FAINT POSITIVE.
26	15000	11475	2025	1500	-	-	" " "
28	10600	6784	2279	1219	265	53	NEGATIVE.
1	6000	2520	3000	300	60	120	"



CASE 21. M.C. aged 18 (female) was admitted to the Royal Infirmary suffering from partially ankylosed jaw. Patient was a healthy girl. It was decided at first to try the effects of forcible movement under an anaesthetic. Chloroform was given for about 15 minutes, and in full anaesthaesia the jaw was moved. Patient made a good recovery and was not sick after the chloroform. This case was chosen simply because Chloroform was to be given and no cutting operation was to be performed.

NOTES on the TEMPERATURE. The temperature rose to 99° on evening of anaesthaesia, then for three days went slightly subnormal, and then continued about the normal line.

THE BLOOD. A. The Red Blood Corpuscles were examined before and after the operation with no variation.

B. The Leucocytes on day of, and day after operation show a slight decrease returning to the normal on third day after operation. The polymorphs were diminished both as regards percentage and absolute numbers after operation, especially on day after operation. The Small Mononucleateds were slightly increased. The Large Mononucleateds were first decreased and then increased. The Transitionals were markedly decreased.

THE CURVES show a slight rise in the temperature curve on day of operation, with a slight fall in polymorph percentage, and the total leucocyte count.

The/

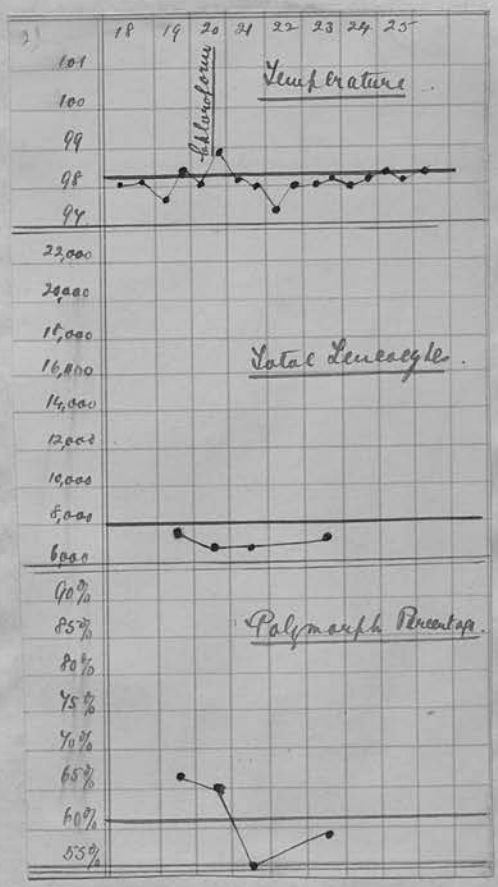
The anaesthaesia, here of course was very short, but the case shows in a striking manner the absence of either leucocytosis or comparative increase in the polymorphs. In fact there was a tendency to the opposite of these conditions, together with an increase in the Small Mononucleateds. It is thus a striking contrast to the ordinary operation case.

BLOOD EXAMINATION & PERCENTAGE DIFFERENTIAL

	Red	White	Poly	S.M.	L.M.	T	E	M.
19.1.1PM.	4800000	7800	67	26.5	4.5	1.75	-	0.25
20.1.3PM.	4330000	6800	65	34	0.75	0.25	-	-
21.1.1PM.	-	6800	54.5	40.5	4.25	0.25	-	0.5
23.1.1PM.	-	7200	58	31	10	0.5	0.5	-

ABSOLUTE DIFFERENTIAL and CLYCOGEN REACTION.

	WHITE	POLY	S.M.	L.M.	T.	E.	M.	
19	7800	5226	2067	351	136	-	20	NEGATIVE
20	6800	4420	2312	51	17	-	-	NEGATIVE
21	6800	3706	2754	289	17	-	34	NEGATIVE
23	7800	4176	2232	720	36	36	-	NEGATIVE



CASE 22. B.D. female aged 23. was admitted to the Royal Infirmary with a lump in the groin. Patient was a healthy young woman. As it was uncertain whether this lump was a Hernia or gland it was decided to explore. Both the Femoral and Inguinal regions were explored. No hernial sac was found but some enlarged glands. The round Ligament was shortened. Chloroform was administered for about 40 minutes. Patient was not sick and made an excellent recovery,- Wound healing by first intention.

NOTES on the BLOOD. A. The Red Blood Corpuscles shew practically no difference on the three occasions on which they were counted there being a decrease of 100,000 on day of operation followed by return to former total next day.

B. THE HAEMOGLOBIN. shewed no appreciable difference being estimated at 80% each day.

C. THE LEUCOCYTES, shew a moderate rise both in total number and in polymorph absolute count three hours after operation, this was followed by a marked decrease next day, which, however, did not continue as there was a slight secondary rise on the second day after operation, however, this fell once again to normal.

THE SMALL MONONUCLEATEDS shew an enormous percentage decrease and a considerable absolute decrease on the/

the day of operation returning towards normal next day.

THE LARGE. MONONUCLEATEDS on day of operation shew a great rise then on next day a slight fall but remaining nearly three times their normal number. The Transitionals shew a slower increase but more quickly regain their normal.

THE EOSINOPHILES were much decreased all through even six days after the operation.

MAST CELLS were seen on each occasion in small numbers and they did not vary much.

NOTES on the TEMPERATURE. On the evening of operation the temperature rose to 99.2° and on day following it reached its maximum 100.2°, coming down on the following day, and being slightly subnormal on the third day after operation, and rising on the fourth day to 99° then coming down and remaining about normal.

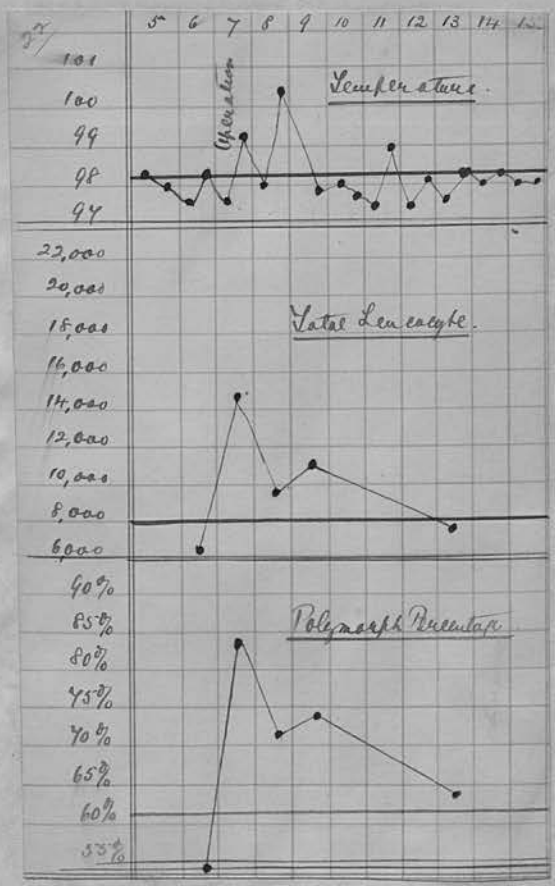
THE CURVES. Once again the temperature curve is the last to reach its maximum on the day after operation, while the total leucocyte curve and polymorph percentage curve reach their maximum within three hours after operation: but on second day after operation while the temperature curve is low the polymorph curve and total leucocyte curve shew a slight rebound then with the exception of the temporary slight rise in the temperature curve they all settle down at normal.

BLOOD EXAMINATION and PERCENTAGE PROPORTIONAL.

	R.	H.	W.	Poly.	S.M.	L.M.	T.	E.	M.
6.2.3Pm.	4600000	80%	6200	53	40	2.5	0.5	3.5	0.5
7.2.3Pm.	4500000	80%	14400	83	11	5	0.5	0.25	0.25
8.2.3Pm.	4600000	80%	9500	71	22	5	1.25	0.25	0.5
9.2.1Pm.			11000	74	20.5	4	1		0.5
13.2.			7600	64	26.5	6.5	0.5	2	0.5

ABSOLUTE DIFFERENTIAL and GLYCOGEN REACTION.

	Total	Poly.	S.M.	L.M.	T.	E.	M.
6	6,200	3286	2480	155	31	217	31
7	14,400	11952	1584	720	72	36	36
8	9,500	6745	2090	475	119	24	47
9	11,000	8140	2255	440	110	-	55
13	7,600	4864	2014	494	38	152	38



Case 23. Mrs Mac N. aged 40, was admitted to the Royal Infirmary with Varicose Veins which had troubled her for several years. Patient was otherwise healthy. It was decided to ligature in several places and excise small bits between the ligatures. This was done under local anaesthaesia, Cocaine and Adrenalin. Patient had some pain after operation but was not sick and the wounds healed by 1st intention.

NOTES on the TEMPERATURE. This never once rose above normal after the operation.

THE BLOOD. The Leucocytes at once rose to 12,200, and went on increasing in number to 14,200, on day after operation. The Polymorphs however reached their maximum percentage three hours after operation, although their absolute maximum was reached day after operation. By the third day after operation, however both the total number of leucocytes and the polymorph percentage had returned to normal. The small Mononucleateds were decreased on each occasion. The blood was examined after the operation. The large Mononucleateds were markedly increased, especially on day after operation. The Eosinophiles, while increased three hours after operation, were diminished on following days. The Mast Cells were present on three occasions.

The /

THE CURVES. While the temperature remained at or below the normal line, the total leucocyte curve and the polymorph percentage curve shew the customary rise the maximum being first reached by the polymorph percentage on day of operation. These two curves came down to normal by the third day after operation.

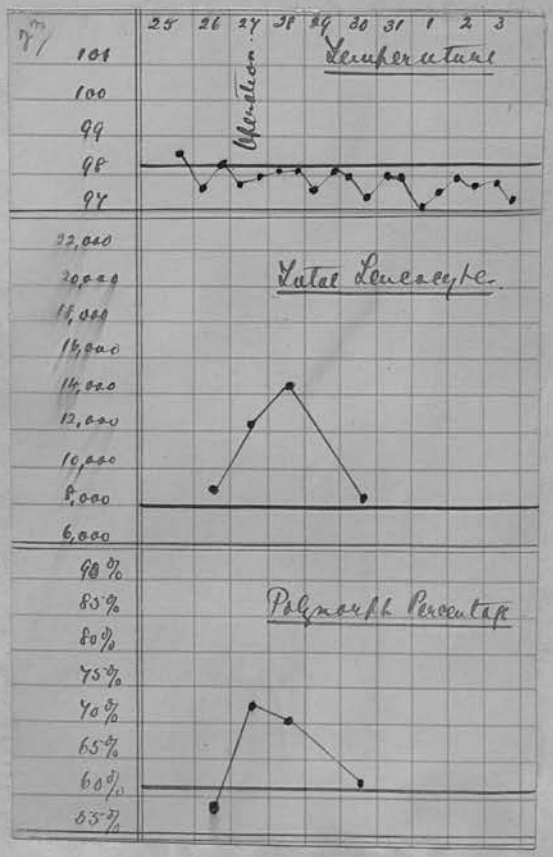
The especial interest of this case lies in the fact that although performed under a local anaesthetic the leucocytes of the blood behave in the same manner as where a general anaesthetic is employed.

BLOOD EXAMINATION and DIFFERENTIAL PERCENTAGE.

	LEUC.	POLY.	S.M.	L.M.	Tr.	E.	M.
26.1. 3Pm.	8900	58	40	0.75	-	0.75	0.5
27.1. 3Pm.	12200	72	23.5	3	-	1	0.5
28.1.12Nn.	14200	70.5	24.25	4	-	0.25	1
30.1 12Nn.	8400	62.5	34.5	2	-	1	-

ABSOLUTE DIFFERENTIAL and GLYCOGEN REACTION.

	Leuc.	Poly.	S.M.	L.M.	T.	E.	M.	
26	8900	5162	3560	67	-	67	44	NEGATIVE.
27	12200	8784	2867	366	-	122	61	NEGATIVE.
28	14200	10011	3444	568	-	35	142	NEGATIVE.
30	8400	5250	2898	168	-	84	-	NEGATIVE.



CASE 24. A.J. male age 14, was admitted to Chalmer's Hospital with a left sided Varicocele. Patient was a healthy looking boy. A loop of the veins was excised. Patient was sick after the anaesthetic, chloroform being given for 30 minutes. The wound healed by first intention and recovery was perfect.

NOTES on the TEMPERATURE. On the day following operation, the maximum was reached 99.4°. The day following, however, the temperature came back to normal and remained there.

THE BLOOD. Two counts were taken here previous to operation, as an attempt was made to find out if the local preparation of the patient had anything to do with the changes in the blood. A large area of the lower part of the abdomen and of the Scrotum was shaved and prepared and then a $\frac{1}{60}$ Carbolic Poultice was applied and left on for nearly 24 hours. The counts obtained before and after the experiment were very similar there being a slight decrease in the polymorph percentage and a slight increase in the Small Mononucleateds, but the difference is well within the ordinary variations. The Red Blood Corpuscles shewed no variation at all.

The first count, taken eight hours after the operation, gave a total of 19,000 and of 90% polymorphs. These gradually fell, and by the /

the 3rd day after operation they had practically returned to normal. The Small Mononucleateds were considerably decreased on the night of operation, while the Large Mononucleateds had greatly increased, especially two days after operation, on which day the Transitionals were also increased. The Eosinophiles were not seen on day of, or second after operation.

THE CURVES, shew that the total leucocyte curve and the polymorph percentage curve reached their maximum on night of operation, while the temperature curve reached its maximum on the evening after operation. The temperature curve, however, returned to normal on the third day, while the total leucocyte and polymorph percentage curves did not do so till the third day.

This case was of interest because the Carbolic Poultice was applied one day earlier than usual, and thus a blood examination was made after it had been on for some time with a negative result.

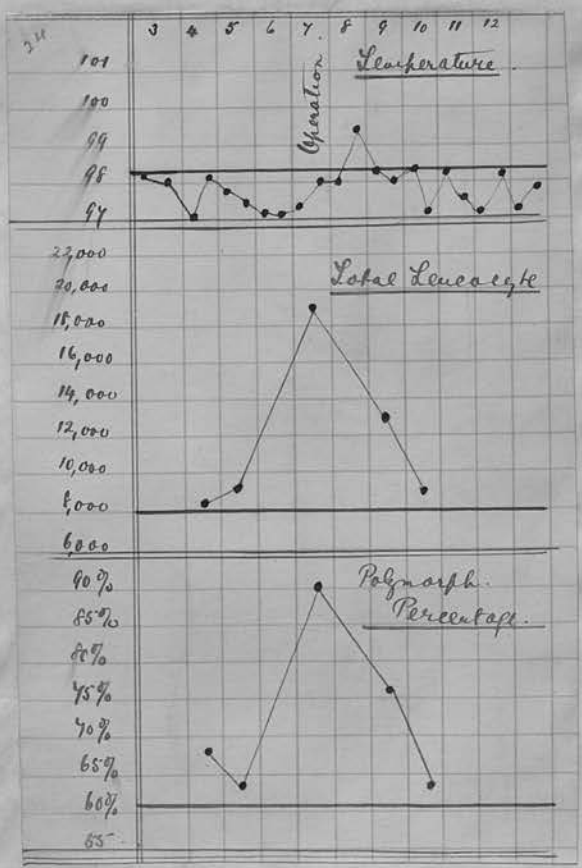
The Glycogen reaction which was negative before the operation, on each occasion after it, gave a very slight positive reaction of the first stage.

BLOOD EXAMINATION AND DIFFERENTIAL PERCENTAGE.

		R.	L.	POLY.	Sm.M.	L.M	T.	E.
4.1	4PM.	4900000	8200	68.5	25	4	2	0.5
	POULTICE.							
5.1	4PM.	4900000	9200	63	29	6	0.5	1.5
7.1	11.OPERATION.							
7.1	8PM.	-	19000	90	6.5	2.5	1	-
9.1	2PM.	-	13000	76	16	6	2	-
10.1	2PM.	-	9000	63.5	33	2	0.5	1

ABSOLUTE DIFFERENTIAL.

	TOTAL	POLY	S.M.	L.M.	T.	E.	
4	8200	5617	2050	328	164	41	NEGATIVE.
5	9200	5796	2668	552	46	138	NEGATIVE.
7	19000	17100	1235	475	190	-	VERY FAINT POSITIVE.
9	13000	9880	2080	780	260	-	VERY FAINT POSITIVE.
10	9000	5715	2970	180	45	90	VERY FAINT POSITIVE.



CASE 25. J.C. aged 26, was operated on for fracture of Patella. As the case is gone into fully under Fracture No. 55, only this reference is made here.

SUMMARY OF RESULTS

of Group with JOINT CASES AND OTHERS (8).

TEMPERATURE. The average of the maximums recorded was 99.7°.

The maximum was on the day of operation in 5 cases
" " " " 1st " after " " 3 "

In one case the temperature did not rise above normal, and in one case the maximum was 100.6°.

The Temperature returned to Normal

on 1st day after operation in 1 case
on 2nd " " " " 2 cases
on 3rd " " " " 2 "
on 4th " " " " 2 "

The time the temperature was above normal averaged two days, and in two cases (both excision of semilunar cartilages) there was a subsequent rise.

THE BLOOD. The Leucocytes averaged

prior to operation 7,700
maximum after " 14,700
Gain 7,000

The lowest maximum being 13,000
" highest " " 19,000

The maximum was reached in 4 cases on day of operation
" " " " " 4 " " " after "

The number of days before they returned to normal averaged 2.25; the earliest being the first day, and the latest, the fourth day.

The /

The Polymorphs - averaged

prior to operation	59%
after "	80%
Gain	21%

The lowest maximum being 72%, and the highest being 90%.

In seven cases the maximum was recorded on day of operation, and in one case, on day after operation. The average number of days before they returned to normal was 2.3, the earliest being on the first day, and the latest, on the fourth day.

THE SMALL MONONUCLEATEDS, decrease markedly in seven cases, while in one, they remain practically stationary.

The maximum decrease was noted

in 5 cases on day of operation
in 2 " " " after "

THE LARGE MONONUCLEATEDS increased in seven cases.

The maximum increase was noted

in 3 cases on day of operation
in 3 " 1st " after "
in 1 case 3rd " " "

THE EOSINOPHILES were decreased after operation in six cases, and in two remained about stationary.

L A P A R A T O M Y C A S E S .

CASE 26. J.W. male, aged 58, was admitted to the Royal Infirmary with supposed abdominal tumour. Patient, although slightly emaciated was fairly healthy. An exploratory laparatomy was performed after keeping the patient under observation for some time. Chloroform was given for about 40 minutes. As nothing definite was found the wound was closed up again. Patient, who was not sick after the operation, made an excellent recovery, the wound healing by first intention. Patient reported himself six weeks after the operation as being in excellent health.

NOTES on the TEMPERATURE. On the evening of the operation, the temperature reached its maximum 100.4° then came down to normal, and on the third day rose once more to 99.4°, returning to normal again next morning, and remaining about 98°.

THE BLOOD. The Leucocytes show a very slight rise in their total number, reaching only 12,400, - (this was the smallest total increase recorded after operation). The first count after operation, which was taken earlier than usual, i.e. 1 hour after operation, gave a total of 11,200. In this count, however, one notices the polymorph percentage to be 86%. On the second/

second day after operation the leucocytes had come down to their former total, although the polymorph percentage still remained up.

The Small Mononucleateds were decreased as usual, especially on day of and day after operation.

The Large Mononucleateds and transitionals varied, decreasing in first count after operation, and then increasing again. The Eosinophiles were much decreased, not being found on second and third days after operation. The Mast cells were found daily, but were much decreased after operation.

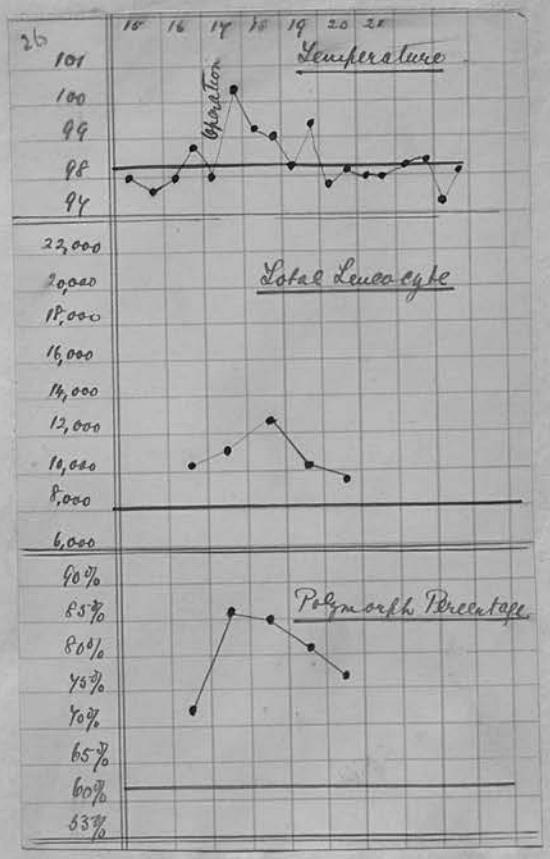
THE CURVES. The temperature curve and polymorph percentage curve reached their maximum on day of operation, while the total leucocyte curve did not do so till the next day. The polymorph percentage remained slightly high, but otherwise the three curves were at normal on the third day.

BLOOD EXAMINATION & PROPORTIONAL PERCENTAGE.

	LEUC.	POLY.	S.M.	L.M.	T.	E.	M.
16.1.3PM.	10200	73	17	6	1	2	1
17.1.1.PM.	operation						
17.1.3.PM.	11200	86	10	2.75	0.25	0.75	0.25
18.1.1.PM.	12400	85	8	6	0.05	0.25	0.25
19.1.1.PM.	10100	81	14.5	4	0.25.-		0.25
20.1.1.PM.	9600	78	15	6.5			0. 5.

ABSOLUTE DIFFERENTIAL & GLYCOGEN REACTION.

	Leuc.	Poly.	S.M.	L.M.	T.	E.	M.	
16.	10200	7446	1734	612	102	204	102	Negative
17.	11200	9632	1120	308	28	84	28	"
18.	12400	10540	992	744	62	31	31	"
19.	10100	8181	1465	404	25	-	25	"
20.	9600	7488	1440	624	-	-	48	"



CASE 27. H.B. female aged 46, had the Gall bladder drained in September 1903, returned to the Royal Infirmary in December 1904, complaining of constant pain in the right hypochondriac region. Patient was rather thin and worn out with the constant pain. It was decided to explore. Under Chloroform the abdomen was opened and then it was found advisable to remove the Gall Bladder. The operation lasted about 60 minutes, a small drain was left in, and patient made an excellent recovery and had no return of the pain.

NOTES on the TEMPERATURE. The maximum 99° was reached the day after the operation, it varied between 98° and 99° till the fifth day after operation.

THE BLOOD. A. The Red Blood Corpuscles show practically no variation in number, form or staining character.

B. The Leococytes rose to their maximum four hours after operation 16,000. The Polymorph percentage, at this time, was very high, 93%. Next day, however, they had both fallen considerably, and by the third day after operation, they were practically down at normal.

The Small Mononucleateds four hours after operation were greatly decreased, especially shown by the absolute figures. On the next day, however, they/

they had returned almost to their former total.

The Large Mononucleateds and Transitionals varied very little, and no Eosinophile or Mast cells were seen at any time.

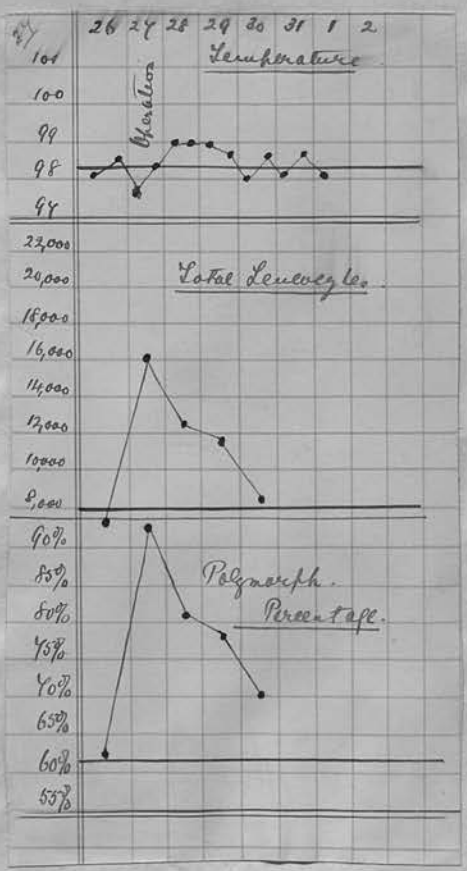
THE CURVES. While we have practically no variation of the temperature curve, the total leucocyte and polymorph percentage curve rose greatly on day of operation, then had returned almost to normal by the third day, whilst there was some slight variation of temperature curve.

BLOOD EXAMINATION & PROPORTIONAL PERCENTAGE.

	REDS	LEU.	POLY.	S.M.	L.M.	T.	E.
26.12 1 Pm	4460000	7000	62.5	33	3.5	1	-
27.12 11 Am	Operation						
27.12 4 Pm	4400000	16000	93	5	1.5	0.5	-
28.12 1 Pm	4600000	12200	81	15.75	2.5	0.75	-
29.12 1 Pm	4500000	11600	78.25	19.25	2	0.5	-
30.12 4 Pm	4450000	8400	70	24.5	3.5	2	-

ABSOLUTE PROPORTIONAL & GLYCOGEN REACTION.

	Leuc.	Poly.	S.M.	L.M.	T.	E.	
20	7000	4375	2310	245	70	-	negative
27	16000	14880	800	240	80	-	very faint
28	12200	9882	1922	305	91	-	negative
29	11600	9077	2233	232	58	-	faint
30	8400	5880	2058	294	168	-	"



CASE 28. J. H. female age 41, was admitted to the Royal Infirmary, complaining of difficulty of swallowing. This was thought to be due to a Carcinoma of the Pharynx, which was evidently involving the Larynx. Patient was very emaciated & worn out. Witzel's Gastrostomy was performed under Cocaine & Adrenalin. For the first few days patient improved greatly, in spite of a swinging temperature; then when this settled down, she was much cheerier and stronger till ten days after, when she had difficulty of breathing and tracheotomy was performed on the 12th day and patient died shortly after.

NOTES ON TEMPERATURE. For three days after operation the swinging nature of the temperature was suspicious of sepsis; but the wound always looked healthy. The maximum 100.4° was reached on the 2nd day after operation, while on the 1st & 3rd day it was 100°. Then on the 4th day it came down and remained near the normal.

THE BLOOD.

A. The Red Blood Corpuscles shewed practically no change in the two counts done.

B. The White Blood Corpuscles in the count before operation gave the large total of 12,000 and polymorph percentage of 74.5%. The maximum of the Leucocyte was reached on the day after operation and was maintained the next day.

The/

The absolute maximum of the polymorph was reached on 2nd day after operation, while percentage maximum was reached 4 hours after operation. Although the numbers after this dropped considerably they still remained very high until the last count, 7 days after operation, 18,000 & 83% (the next day a count was to be taken, but as the patient was requiring tracheotomy it was decided not to do one). THE SMALL MONONUCLEATEDS were decreased in absolute numbers on day of operation and varied the other days, while in percentage count they were much decreased every day. THE LARGE MONONUCLEATEDS also varied considerably in absolute count, while in percentage count they were decreased daily. THE TRANSITIONALS varied considerably and Myelocytes were seen on one day. EOSINOPHILES were very scarce being seen only twice.

A faint Glycogen reaction was got before the operation; this was present throughout.
NOTES ON CURVES. The temperature curve reached its maximum on 2nd day after operation, while the total leucocyte curve did so on the day after operation, & polymorph percentage curve on the day of operation. The temperature curve swung for the first three days and/

and then settled down. The total leucocyte curve maintained its maximum for a day and then came down gradually, but never reached its former normal.

The Polymorph percentage curve came down slightly on 2nd day and then rose again, but on the 7th day was going down once more.

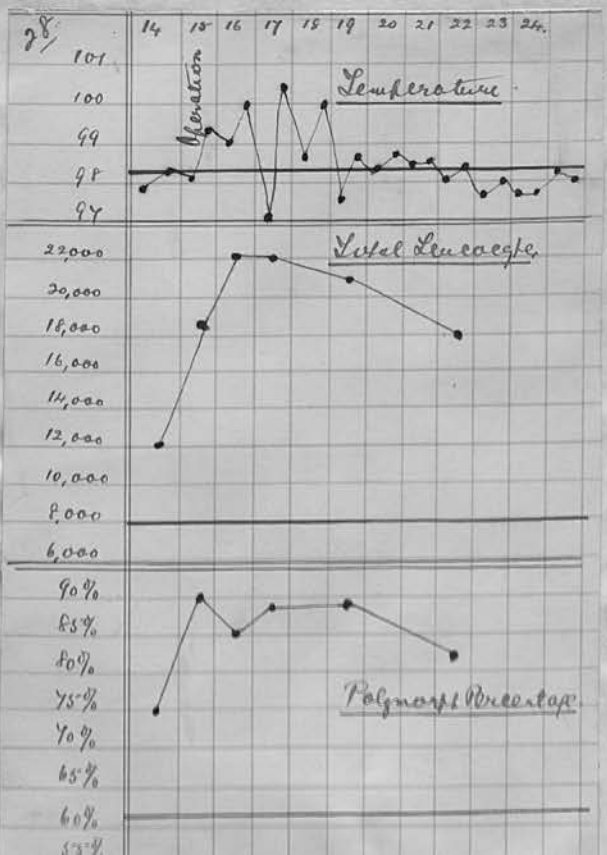
This case is of interest as having been done under local anaesthaesia, but its results must be partially discounted because the case was extremely pathological, but still 4 hours after operation one sees the usual rise in leucocytes and large polymorph percentage. There was no evidence at any time that the wound was septic, but undoubtedly the growth in the pharynx was ulcerating, and would be enough to cause the primary high count & would probably help to keep the count high after operation.

BLOOD EXAMINATION & PROPORTIONAL PERCENTAGE.

	R.B.C.	LEU.	POLY.S.M.	L.M.	T.	E.
14.12 4 Pm	4160000	12000	74.5	14.5	10	1	-
15.12 4 Pm	4130000	18600	90	6	3.5	0.5	-
16.12 4 Pm	-	22000	85	8	6	1	-
17.12 4 Pm	-	22000	88	11	1	-	-
19.12 4 Pm	-	20800	88.5	6	4.25	0.75	0.5
22.12 4 Pm	-	18000	83	10	4	1.5	0.5 & 1% Myelocyte

ABSOLUTE PERCENTAGE & GLYCOGEN REACTION.

	LEU.	POLY.S.M.	L.M.	T.	E.		
14	12000	8940	1740	1200	120	-	faint positive
15	18600	16740	1116	651	93	-	" "
16	22000	18700	1760	1320	220	-	" "
17	22000	19360	2420	220	-	-	" "
19	20800	18408	1248	884	156	104	" "
22	18000	14940	1800	720	270	90	" " Myelocyte 180



CASE 29. P. T. aged 51 (male) was admitted to the Royal Infirmary complaining of passing large quantities of blood by the bowel. Patient was extremely pale and feeble, although it was evident that at one time he had been a well built and muscular man. An exploratory Laparatomy was performed under Chloroform (30 minutes) but, as a large growth was found involving the coecum and ascending colon, with many adhesions, it was found impossible to remove it. Patient was not sick after the operation and after the first 2 days he was extremely comfortable and looked better than he had done previous to the operation.

NOTES ON TEMPERATURE. The temperature, which on admission varied for several days, between 99° & 100.2° settled down between 98° & 99° for two days previous to operation. The maximum 100.2° was reached the day after operation, coming down next day and remaining at normal, except on the 5th and 6th days after operation, when it rose to 98.6° & 98.8°; thus after the operation with the exception of the rise to 100.2° the temperature was far more settled than it was prior to the operation.

THE BLOOD.

A. The Red Blood Corpuscles which were extremely low prior to operation, 2,850,000, four hours after operation rose /

rose to 3,420,000; this rise was maintained and on the 3rd day after operation it was up to 3,550,000. The Reds were very poorly stained & in all the films there was some poikylocytosis but no nucleated reds were seen.

B. The Haemoglobin, which prior to operation was only 35%, rose almost in proportion with the rise in the Red Blood Corpuscles to 40%.

C. The Leucocytes, four hours after operation had risen only to 9,800, while on the day after they reached 14,800, & on the 2nd day after operation the maximum of 15,800 was reached, falling next day to practically the normal. The polymorph percentage rose to 73 4 hours after operation, but it also reached its maximum on the 2nd day after, coming down next day to below the former normal.

The maximum increase in the polymorphs in this case amounted only to 9.5%, while in the absolute count the rise was from 4,774 to 11,692. THE SMALL MONONUCLEATEDS on the day after the operation were increased in absolute total, and remained so until the last count. THE LARGE MONONUCLEATEDS were considerably increased, especially on the 2nd day after operation. There were a few TRANSITIONALS seen each day, one or two of which were very like Myelocytes. EOSINOPHILES, which were never abundant, were absent on day of operation and for two days after. Mast Cells appeared on day after operation & were fairly numerous on 6th/

6th day after operation.

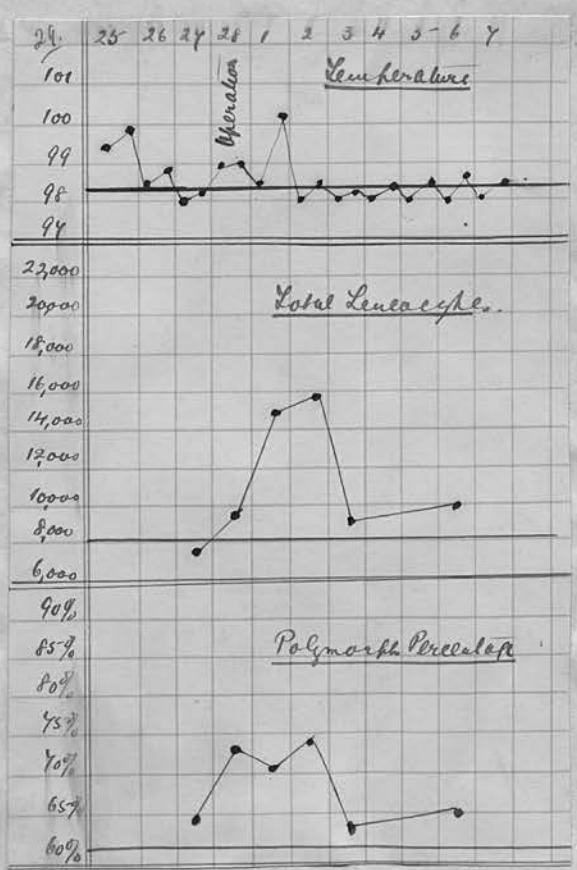
THE CURVES are of interest, shewing the maximum of temperature curve the day after operation, and the delayed maximum of total leucocyte curve, and of the polymorph percentage curve on 8th day after operation, when the temperature curve was at its normal. The Leucocyte & polymorph percentage curve returned practically to normal on the 3rd day.

BLOOD EXAMINATION & DIFFERENTIAL PERCENTAGE.

		REDS	H.%	LEU.	POLY.	S.M.	L.M.	T.	E.
27.2	1 Pm	2850000	35	7400	64.5	31	4	0.25	0.25 M. -
28.2	11 Am	Operation							
28.2	4 Pm	3420000	40	9800	73	22	4.5	0.5	- M. -
1.3	4 Pm	3540000	40	14800	71.5	24	4	0.25	- M.0.25
2.3	1 Pm	3380000	40	15800	74	21	4.5	0.25	- M.0.25
3.3	3Pm	3550000	-	9000	62.5	34	2.5	-	- M.0.5
6.3	3Pm	-	-	10000	65	29.5	3.5	0.5	0.25 M.1.25

GLYCOGEN REACTION & ABSOLUTE DIFFERENTIAL.

	~~REDS~~	LEU.	POLY.	S.M.	L.M.	T.	E.	
27	7400	4774	2294	296	18	18	-	Negative
28	9800	7154	2156	441	49	-	-	Negative
1	14800	10582	3552	592	37	-	37	Negative
2	15800	11692	3318	712	39	-	39	Negative
3	9000	5625	3060	225	-	45	45	Negative
6	10000	6500	2950	350	50	25	125	Negative



CASE 30. T. Mch. 33, male, was admitted to the Royal Infirmary complaining of chronic dyspepsia. The stomach was found to be dilated. After observation it was decided to do Gastro-enterostomy. Patient looked fairly healthy & was well developed although thin. The anaesthetics were Chloroform at first (1 oz) then Ether 3½ oz; the operation lasted nearly 1½ hours. Patient was slightly sick after operation, but otherwise made a good recovery.

NOTES ON TEMPERATURE. This case shewed practically no rise of temperature, the maximum 98.8°o being reached on day after operation, thereafter it was slightly subnormal.

THE BLOOD.

A. The Red Blood Corpuscles shewed practically no change after the operation.

B. The Leucocytes reached their maximum less than 4 hours after operation as did the polymorph percentage. They came down to their normal gradually, & by the 3rd day after operation the total leucocytes were considerably lower than they had been previous to operation, while the polymorph percentage was about the same.

THE SMALL MONONUCLEATEDS were decreased on each occasion after operation, while the LARGE MONONUCLEATEDS were greatly increased especially on the day after operation. THE EOSINOPHILES were seen only on/

on two occasions, a great number being found 2 days after operation.

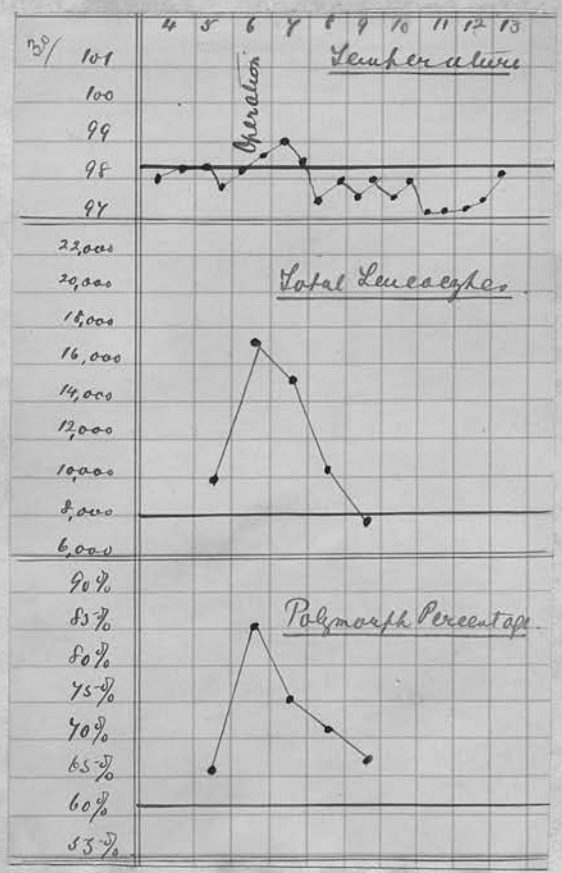
THE CURVES. Although practically there was no rise in the temperature curve, we see the usual variation in the total leucocyte & polymorph percentage curves, the maximum in both cases being reached on the afternoon of the operation; both had practically returned to normal 2 days after operation.

BLOOD EXAMINATION & PERCENTAGE PROPORTIONAL.

	R.B.C.	LEU.	POLY.	S.M.	L.M.	T.	E.
5.12 4 Pm	5000000	10000	66	29	4.75	-	0.25
6.12 4 Pm	5000000	17200	85.25	11.25	3.5	-	-
7.12 4 Pm	-	15200	75	13.5	10	1.5	-
8.12 4 Pm	4850000	10200	71	15	10	1	3
9.12 4 Pm	5000000	7600	67.5	25	7	0.5	-

ABSOLUTE PERCENTAGE & GLYCOGEN REACTION.

5	10000	6600	2900	475	-	0.25	negative	
6	17200	14663	1935	602	-	-	v. faint	positive
7	15200	11400	2052	1520	1.5	-	v.	" "
8	10200	7242	1530	1020	1	3	v.	" "
9	7600	5130	1900	532	0.5	-	v.	" "



CASE 31. A. K. (female) aged 22, was admitted to the Royal Infirmary suffering from chronic dyspepsia and dilated stomach. Patient was emaciated but very bright. It was resolved to do Gastro-enterostomy, as there was considerable Stenosis of the Pylorus. Chloroform was given for about 65 minutes. Patient was scarcely sick at all, and made an excellent recovery, the wound healing by first intention. Patient felt better than she had done for years previously.

NOTES ON TEMPERATURE. The maximum was attained on the evening of the operation, 100.2°. It fell slightly next day to 100° and then on third day after operation it had reached normal, and remained slightly subnormal.

THE BLOOD.

A. The Red Blood Corpuscles did not vary.

B. The Leucocytes prior to operation were only 5,600, but polymorph percentage was 74. The maximum reached was only 9,000, but the polymorphs more than doubled in absolute numbers and reached 90%. The total dropped very slowly, and on the 7th day after operation it was below the first count. The polymorph percentage also dropped slowly, but on the 4th day there was a distinct rebound, falling again considerably by the 7th but even then not reaching the normal, although in absolute numbers the polymorphs were below the first count.

THE/

THE SMALL MONONUCLEATEDS in percentage fell on day of operation, but considerably rose thereafter. THE LARGE MONONUCLEATEDS & TRANSITIONALS varied considerably but decreased after operation. EOSINOPHILES & Mast Cells were present on four occasions, varying slightly in their numbers.

NOTES ON CURVES. The temperature curve attained its maximum on the day of operation, as did the total leucocyte curve and the polymorph percentage curve. The temperature curve was the first to return to normal, the total leucocyte the next; the polymorph percentage rose again on the 4th day and never quite reached the normal line.

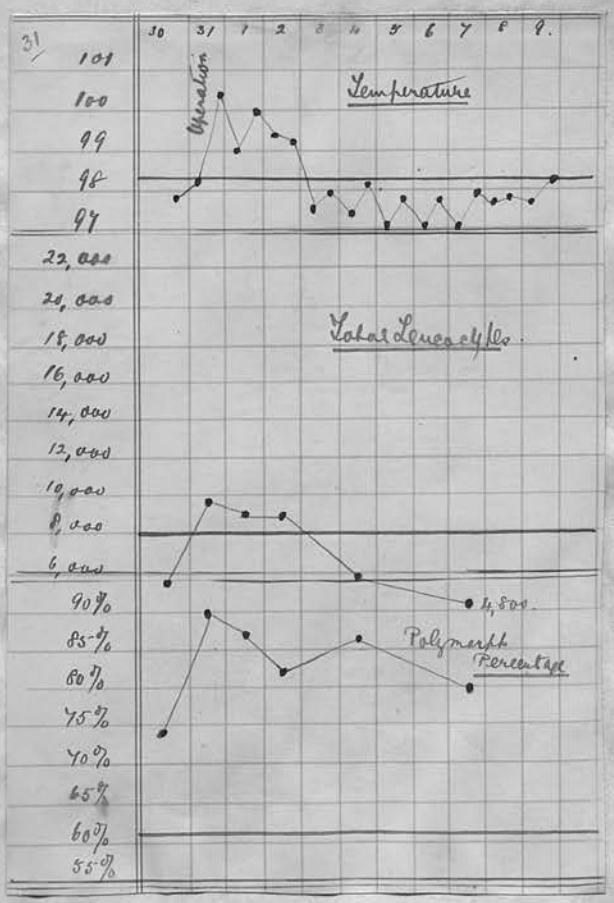
This case is of interest as it shewed the lowest count reached after operation, 9,400. Although this was an increase of 3,800 it was a larger increase than was found in Case 26, where the increase was from 10,200 to 12,400 on the 2nd day; also in Case 45 where increase was from 9,000 to 12,000 on day after operation. The polymorph percentage reached more than the ordinary figures found in post-operation cases, and continued high till the last investigation; at no time was there the least evidence of sepsis.

BLOOD EXAMINATION & PROPORTIONAL PERCENTAGE.

	REDS	LEU.	P.	S.M.	L.M.	T.	E.	M.
30.1 4 Pm	4500000	5600	74	14	9.5	1.5	0.5	0.5
31.1 4 Pm	-	9400	90	6	3.75	-	-	0.25
1.2 4 Pm	4500000	8800	87	9.75	2.5	0.5	0.25	-
2.2 1 Pm	-	8600	82	10.75	5.5	1.5	-	0.25
4.2.12 Nn	-	5800	87	11.5	1	0.25	0.25	-
7.2 4 Pm		4800	80	13	4	2	0.5	0.5

ABSOLUTE PERCENTAGE & GLYCOGEN REACTION.

	TOTAL	POLY.	S.M.	L.M.	T.	E.	M.
30	5600	4144	784	532	84	28	28
31	9400	8460	564	352	-	-	24
1	8800	7656	858	220	44	22	-
2	8600	7052	925	473	129	-	21
4	5800	5046	668	58	14	14	-
7	4800	3840	624	192	96	24	24



CASE 32. J. M'K. aged 27, (male) was admitted to the Royal Infirmary, Edinburgh, complaining of chronic dyspepsia lasting for years; his stomach having to be washed out for some months past. Patient was pale and rather thin. Gastro-enterostomy was performed under Chloroform, operation lasting about 50 minutes. Patient made an excellent recovery and was not sick at all.

NOTES ON TEMPERATURE. The Temperature, the night before operation, rose to 99.2°; the maximum 99.4° was reached on night of operation and also on day after, but by the 2nd day the temperature had returned to normal.

THE BLOOD.

A. The Red Corpuscles shewed practically no variation.

B. The Leucocytes reached their maximum on the night of the operation. They were counted before patient was out of Chloroform, immediately after the operation, when they shewed a slight increase. Although the polymorph percentage had increased from 55.5 to 75 the maximum here also was reached in the evening, 94.25%. By the 3rd day after operation both the total leucocyte & polymorph percentage had returned to normal, while on the 4th day the leucocytes had reached their maximum.

THE/

THE SMALL MONONUCLEATED Cells on night of operation were only about ¼ of what they had been previous to operation, and although they increased after this, they never came back to previous figures. THE LARGE MONONUCLEATED Cells were decreased on day of operation, but on 2nd & 3rd days after operation, they were much increased, returning to normal on 4th day after operation. THE EOSINOPHILES were absent on day of and second day after operation, returning on third day after operation.

THE CURVES. The 3 curves were at their maximum on night of operation. The temperature curve remained at this point next day and came down to normal on 2nd day, while both the total leucocyte curve and the polymorph percentage curve remained above normal till the third day after operation.

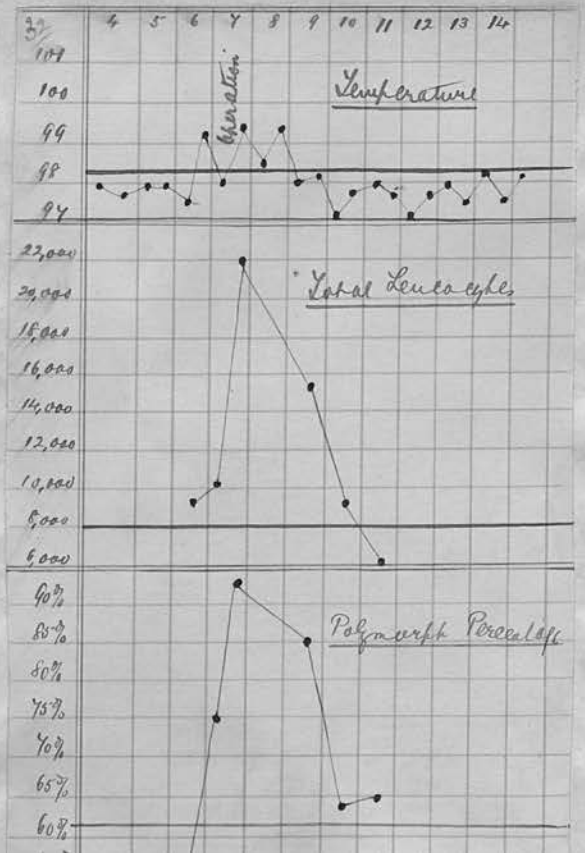
This case was examined twice on day of operation (1) immediately after operation, while the patient was still under Chloroform & (2) in the evening seven hours after operation. One finds that immediately after the operation the polymorphs are increasing, although there is not much increase in the total number of leucocytes. The Red Blood Corpuscles were practically the same, shewing only a slight increase of 100,000. By the evening one finds the ordinary increase in the leucocytes & especially in the polymorphs which are as high as 94.25%.

BLOOD EXAMINATION & DIFFERENTIAL PERCENTAGE.

		REDS	LEU.	POLY.	S.M.	L.M.	T.	E.
6.1	4 Pm	5100000	9400	55.5	41	2.5	0.5	0.5
7.1	11.10	A.m. Operation						
7.1	12 Nn	5200000	10200	75	24	1	-	-
7.1	8 Pm	-	22000	94.25	4.75	1	-	-
9.1	12 Nn	5000000	13400	85	11	4	-	-
10.1	3 Pm	-	9000	63.5	30	4.5	1.5	0.5
11.1	3 Pm	-	6200	65	30	4	0.25	0.75

ABSOLUTE DIFFERENTIAL & GLYCOGEN REACTION.

	TOTAL	POLY.	S.M.	L.M.	T.	E.	
6	9400	5217	3854	235	47	47	negative
7	10200	7650	2448	102	-	-	"
7	22000	20735	1045	220	-	-	"
9	13400	11390	1474	536	-	-	"
10	9000	5715	2700	405	135	45	"
11	6200	4030	1860	248	16	46	"



S U M M A R Y OF R E S U L T S

of

1st SERIES OF LAPARATOMY CASES (7).

TEMPERATURE. The average of the maximums recorded was 99.8°. The maximum was on

the day of operation		in 2	cases
1st	" after "	in 4	cases
2nd	" " "	in 1	case.

The lowest maximum was 99°, and the highest 100.4°.

The temperature returned to normal on

1st	day after operation	in 1	case
2nd	" " "	in 3	cases
3rd	" " "	in 2	"
4th	" " "	in 1	case.

The time the temperature was above normal averaged two days.

THE BLOOD. The Leucocytes averaged

prior to operation	9,000
maximum after "	16,400
Gain	7,400.

The lowest maximum was 9,500 (lowest in whole series), and the highest 22,000.

The maximum was reached on day of operation in 4 cases, on day after in 2 cases, and on 2nd day after in 1 case. The average number of days for 6 cases before they returned to normal was 3: the shortest/

shortest being 2 and the longest 4. The seventh case remained rather above normal.

THE POLYMORPHS averaged

	prior to operation	65%
maximum after	"	87%
	Gain	22%.

The lowest maximum being 74%; the highest 94%.

In 6 cases the maximum was recorded on day of operation, and in the 7th case on the 2nd day after. The average number of days for 6 cases before they returned to normal was 3.5, the earliest being 3 and the latest 6 days. The 7th case remained rather above normal.

THE SMALL MONONUCLEATEDS decreased in every case. The maximum decrease was on day of operation in 5 cases, on 1st day after in 1 case and on 2nd day after in one case.

THE LARGE MONONUCLEATEDS increased in 6 cases, but in 3 of these the increase was very slight. The maximum increase was on day after operation in 5 cases, and on the 2nd day after in one case.

THE EOSINOPHILES shew a great decrease in four cases.

S E R I E S B.

Where there was slightly more hoemorrhage than in preceding cases.

CASE 33. A.T. female aged 32 who was operated on in 1903 for Appendicitis returns now with a Ventral Hernia. Patient was a healthy well developed woman. A cure was performed for the Hernia the parts being well braced up under Chloroform, operation lasting ¾ of an hour. Patient made an excellent recovery: wound healing by first intention.

NOTES on the TEMPERATURE. The temperature reached its maximum on the evening of the operation 99.4°. It remained at this on the next day, and two days after operation it was 99° and then on following day it came down to normal.

THE BLOOD. A. The Red Blood Corpuscles shewed no change after operation.

B. THE LEUCOCYTES, and the Polymorph percentage reached their maximum four hours after operation then decreased reaching their normal on the third day, though even then the polymorph percentage had scarcely come down to its former figure. The Small Mononucleateds were markedly decreased on day of, and day after operation. The Large Mononucleateds were on the other hand much increased especially on the second day after operation on which day the transitionals/

transitionals were also increased.

THE EOSINOPHILES were absent on day of operation and slowly returned towards the normal thereafter.

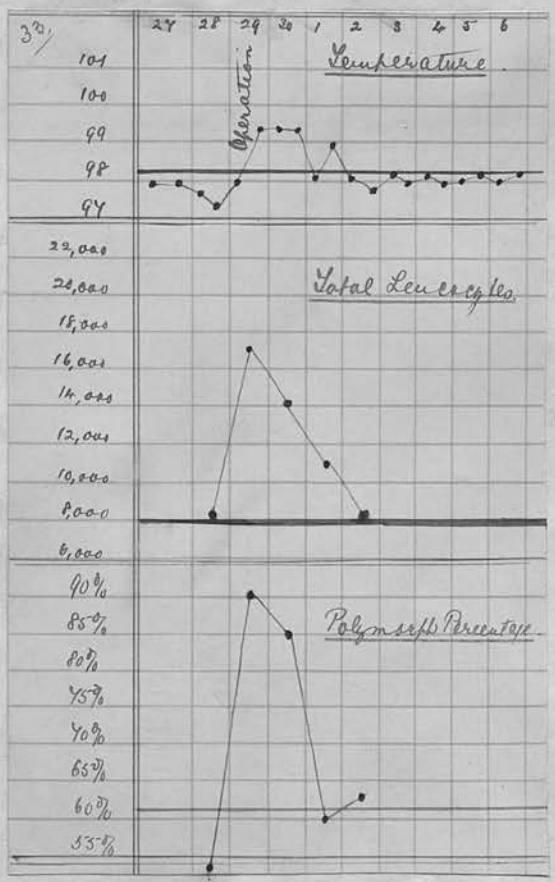
THE CURVES shew the maximum reached on the day of operation by all three and whereas the polymorph percentage curve had returned to normal two days after the operation; the temperature curve and total leucocyte curve did not return till the third day.

BLOOD EXAMINATION and DIFFERENTIAL PERCENTAGE.

	Red	Leuc.	Poly.	S.M.	L.M.	T.	E.
28.11.4Pm.	4300000	8200	52.5	42.5	1.5	1	2.5
29.11.4Pm.	4300000	17000	90	7	2.5	0.5	
30.11.4Pm.	4200000	14000	85.5	10	3	0.75	0.75
1.12.1Pm.		11000	60	27.5	10	1.5	1
2.12.4Pm.		8000	63	26	8	1	2

ABSOLUTE DIFFERENTIAL and GLYCOGEN REACTION.

	Total	Poly.	S.M.	L.M.	T.	E.	
28	4305	3485	3485	123	82	205	Negative
29	15300	1190	1190	425	85		Negative
30	11970	1400	1400	420	105	105	Very faint positive
1	6600	3025	3025	1100	165	110	Negative
2	5040	2080	2080	640	80	160	Negative



CASE 34. J.C. aged 23 (male) was admitted to the Royal Infirmary suffering from Ventral Hernia. Patient was rather poorly developed. He was operated on under (1) Chloroform and then (2) Chloroform and Ether mixture the parts being stitched together and braced up. The operation lasted one hour. Patient did extremely well, wound healing by first intention.

NOTES on the TEMPERATURE. The maximum was reached on day following operation 99.8° and on next day it was 99.2° returning to normal on the third day after operation.

THE BLOOD. A. The Red Blood Corpuscles shewed a very slight increase on day after operation. B.The Leucocytes reached their maximum at first count scarcely two hours after operation. The polymorphs which on day before operation had amounted to only 45.5% reached 83% increased in absolute number 5.8 times.(the largest increase compared with the first count in the whole series of cases) Both the total leucocytes and the polymorphs, however, quickly fell although they scarcely returned to their former low number. The Small Mononucleateds were slightly decreased in absolute number but markedly in proportion on day of, and day following operation while the Large Mononucleateds were much increased after the operation/

operation especially on day after operation. The Eosinophiles were increased day of operation and were absent on the next day. Mast cells were seen on third day after operation.

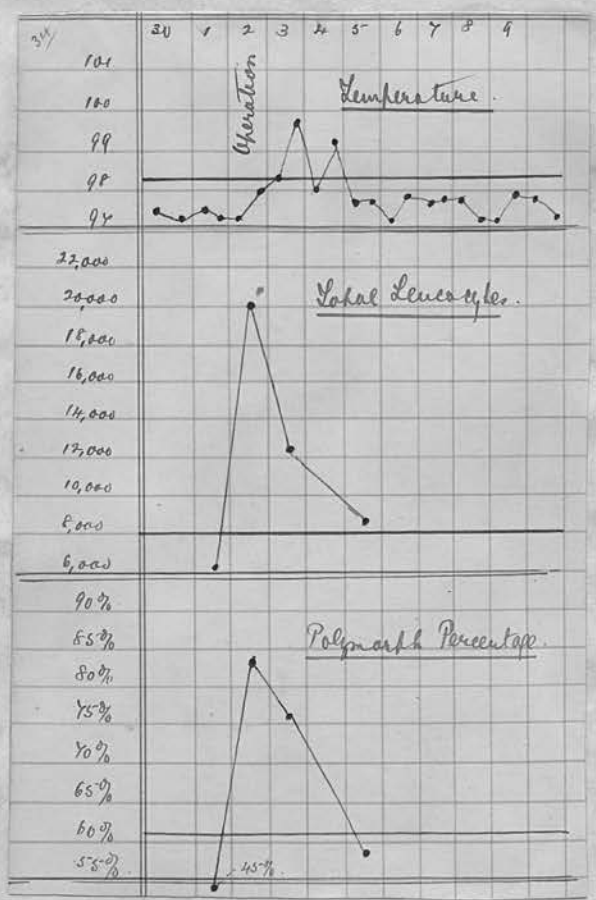
THE CURVES. The total leucocyte and polymorph percentage curves reached their maximum within two hours of operation, while the temperature curve did so on the following day, all three returning to normal on third day after operation.

BLOOD EXAMINATION and DIFFERENTIAL PERCENTAGE.

	Red	Leuc.	Poly.	S.M.	L.M.	T.	E.	M.
1.12.4Pm.	4600000	6200	45.5	51	2.5	0.5	0.5	-
2.12.1Pm.	Operation							
2.12.4Pm.		20000	83	12.5	3	1	0.5	-
3.12.12N.	4800000	12400	76	17	7	-	-	-
5.12.12N.		8600	58	36	4	1	-	1

ABSOLUTE DIFFERENTIAL and GLYCOGEN REACTION.

	Poly.	S.M.	L.M.	T.	E.	M.	
1	6200	2821	3162	155	31	31	- Negative
2	20000	16600	2500	600	200	100	- Very faint positive
3	12400	9424	2108	868			Negative
5	8600	4988	3096	344	86		86Very faint positive



CASE 35. Mrs R. McD. aged 52, was admitted to the Royal Infirmary suffering from a Ventral Hernia, resulting from an operation four years ago. Patient was a rather thin and exceedingly nervous woman. She was operated on under Chloroform for fifty minutes, the parts being stitched together and braced up. She was rather sick after the operation, and when this wore away, she became very despondent, however, everything seemed to go well, and the stitches were taken out on the eighth day, when the skin had healed and there was no sign of swelling. On the tenth day, however, as she complained of pain, the wound was dressed, and as there was some swelling, the wound opened up and pus escaped from a deep abscess which yielded a pure culture of Bacillus Coli. Patient had very little discomfort, and after being drained for some time, the wound healed up. (Compare case 10). It is difficult to understand the presence of pus here. If it had been due to something introduced when the wound was dressed, one would have expected some other organism as well as, or instead of, the Bacillus Coli Communis. It rather looks as if there had been some escape of Bacillus Coli at the time of the operation, or shortly after, which, acting slowly on the weakened tissues, was able to produce /

produce such a slow growing abscess.

NOTES on the TEMPERATURE. The temperature rose to 98.8° on night of operation, and on second day after operation to 99.6° (Maximum) next day it was 99° and on fourth day, it was down to normal and remained thereabouts.

THE BLOOD. The Leucocytes reached their maximum three hours after operation, as did the polymorph percentage. The day after operation, the total leucocytes had dropped to 11,200 rising slightly next day, and on the fourth day falling lower than they had been before the operation. The polymorphs on the other hand, fell to 80% on day after operation, but on the second day they rose once more to 83%.

The Small Mononucleateds decreased progressively after the operation, reaching their lowest on second day.

The Large Mononucleateds were slightly decreased on day of operation, but on the next two days were increased, the transitionals varied.

The Eosinophiles were not seen after operation till the fourth day, by which time the total leucocytes had quite returned to normal, and the polymorph percentage was nearly back to normal.

THE CURVES. The total leucocyte andpolymorph percentage curve were as usual at their maximum on day of/

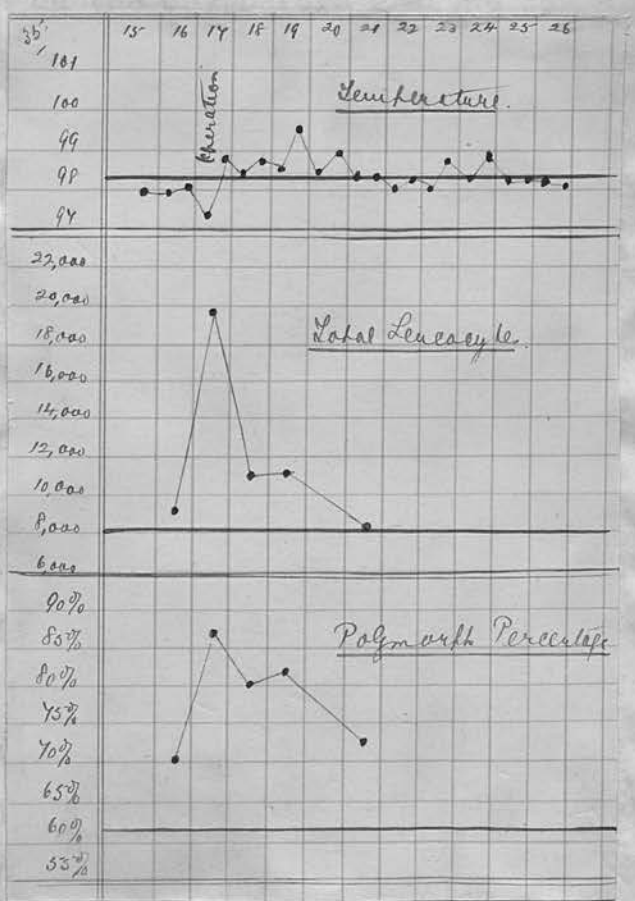
of operation, while the temperature curve was only slightly up. However, the temperature maximum on second day after operation coincided with a slight rebound of other two curves. All three were at their normal by the fourth day.

BLOOD EXAMINATION & DIFFERENTIAL PERCENTAGE.

	WHITES	P.	S.M.	L.	T.	E.	Mast.
16.1.4.PM.	9200	70	23	5	0.75	1.25	-
17.1.11.AM.	Operation						
17.1.3.PM.	19800	87.25	10	2	0.75	-	-
18.1.3.PM.	11200	80	14	5.5.	0. 5.	-	-
19.1.3.PM.	11400	83	10	6	1	-	-
21.1.12 Nn.	8000	73	18.5	7	-	1	0.5.

GLYCOGEN REACTION & ABSOLUTE DIFFERENTIAL.

	Whites	P.	S.M.	L.	T.	E.	Mast	
16.	9200	6440	2116	460	69	115	-	Negative
17.	19800	7275	1980	396	149	-	-	"
18.	11200	8960	1568	616	56	-	-	Very faint posit.
19.	11400	9462	1140	684	114	-	-	Negative
21.	8000	5840	1480	560	-	80	40	"



CASE 36. Mrs M. age 29 was admitted to the Royal Infirmary suffering from an Umbelical Hernia, this had started 3 years ago and had been gradually growing worse. Patient was a very stout woman, weighed 15 stones. The operation lasted 70 minutes under Chloroform. Patient was not sick after it and made an excellent recovery.

NOTES on the TEMPERATURE. On three occasions the temperature reached 99° , on the night of the operation, on the second day after operation, and on the fourth day, at other times it was at or below normal.

THE BLOOD. A. The Red Blood Corpuscles shewed no variation on the day before and the day after the operation.

B. THE LEUCOCYTES. The Leucocytes reached their maximum three hours after operation, as did the polymorph percentage, the total leucocytes count fell considerably next day, while the polymorph percentage remained at its maximum both, however, reached their normal at the same time. (the fourth day after operation)

The Small Mononucleateds decreased after operation reaching their minimum on the 2nd day after operation, but returned to normal by the fourth day while the large Mononucleateds decreased after operation. The Eosinophiles were absent on day after operation /

operation and Mast cells were present on three occasions.

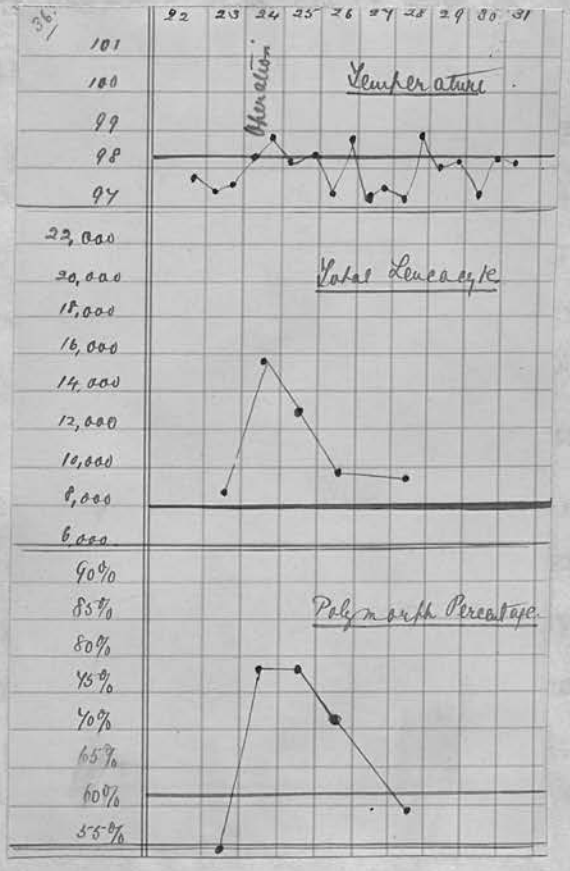
THE CURVES. The temperature curve is slightly variable within small limits: it reaches its maximum along with the polymorph percentage curve and the total leucocyte curve and is the first to return to normal, only however, to rise slightly on two later occasions finally settling down on the fifth day, while the other two do so on the fourth day.

BLOOD EXAMINATION and DIFFERENTIAL PERCENTAGE.

	P.	W.	Poly.	S.M.	L.M.	T.	E.	M.
23.1. 1Pm.	4300000	8800	53	38	7.5		0.5	1
24.1.11Am.	Operation							
24.1. 3Pm.		15600	78	18.5	3		0.5	
25.1. 3Pm.	4300000	13000	78	18	3	0.75		0.25
26.1. 1Pm.		9800	71	20.5	5.5	2.5	0.25	0.25
28.1. 4Pm.		9400	59.5	37	2	0.75	0.75	

GLYCOGEN REACTION and ABSOLUTE DIFFERENTIAL.

	Leuc.	Poly.	S.M.	L.M.	T.	E.	M.	
23	8800	4664	3364	660		44	88	Negative
24	15600	12168	2886	468		78		Negative
25	13000	10140	2340	390	97		33	Negative
26	9800	6958	2009	540	245	24	24	Very faint positive
28	9400	5594	3478	188	70	70		Negative



CASE 37. Mrs.W. aged 40, admitted to Royal Infirmary suffering from a bad Umbelical Hernia Patient was a stout, very nervous woman. The operation was difficult, as there were many adhesions. Chloroform was given for about 70 minutes. After operation patient was in a bad state of shock, from which she barely recovered, dying about 28 hours after the operation. No post-mortem was allowed. Patient was slightly sick once or twice on afternoon of operation.

NOTES on TEMPERATURE. The temperature for several days before operation varied between 98.4° and 99°, and on night after operation it was 99° and morning before death 98°.

THE BLOOD. The Leucocytes which before operation amounted to 10,000 rose within three hours to the enormous total of 35,000, of which 84% or 29,400 were Polymorphs. Next day about four hours before death, the total had fallen to 29,500 but the polymorphs had increased to 85%. The Small Mononucleateds were slightly increased day of operation, but were diminished next day, while the Large Mononucleateds were greatly increased, especially on day after operation. The Transitionals were also increased after the operation. The Eosinophiles and Mast cells, while/

while present prior to operation, were not seen subsequent to it.

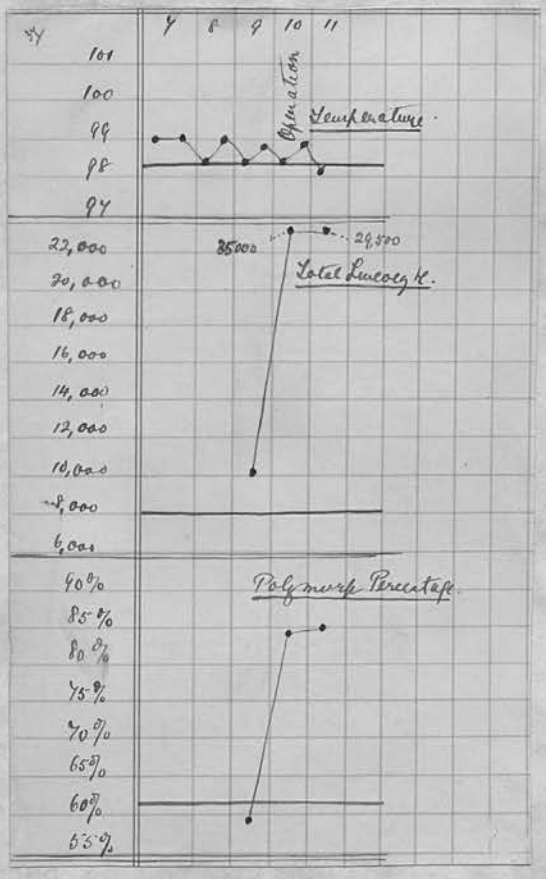
The interest of this case lies in the enormous leucocytosis found on both counts after operation, and in the condition of shock that patient was in.

BLOOD EXAMINATION & DIFFERENTIAL PERCENTAGE.

	Leuc.	Poly.	S.M.	L.M.	T	E.	M.
9.2 3.PM.	10,000	59.5	33.5	4.5	1	1	0.5
10.2 11.AM.	Operation						
10.2. 3.PM.	35,000	84	11	4	1	-	-
11.2.Noon.	29,500	85	8	6	1	-	-

GLYCOGEN REACTION & ABSOLUTE DIFFERENTIAL.

	Leuc.	Poly.	S.M.	L.M.	T.	E.	M.	
9.	10000	5950	3350	450	100	100	50	Negative
10.	35000	29400	3850	1400	350	-	-	"
11.	29500	25075	2360	1770	295	-	-	"



S U M M A R Y of C A S E S

OF

VENTRAL & UMBELICAL HERNIA (5.)

Of the five cases one died day after operation. (This is excluded from averages where necessary.)

TEMPERATURE. The average of the maximums was 99.2°. The maximum was recorded -

On day of Operation in 3 Cases
" " after " " 1 Case
On 2nd " " " " 1 "

The lowest maximum was 99.8°., and the highest was 99.8°. The temperature returned to normal on -

1st day after Operation in 2 Cases
3rd " " " " 2 "
4th " " " " 1 Case.

The time the temperature was above normal averaged 2 days.

THE BLOOD.

LEUCOCYTES averaged -

Prior to Operation	7,800
Maximum after "	21,400
Gain	13,600

The lowest maximum being 15,500
" highest " " 35,000.

The maximum was reached on day of Operation in each case. The average number of days before the leucocytes returned to normal was three, - the earliest being on the second day, and the latest on the sixth.

The/

The Polymorphs averaged -

Prior to Operation	56%
After "	84%
Gain	28%

The lowest maximum being 78%
" highest " " 90%

The maximum was reached on day of operation in four cases, and on the day after in one case.

The average number of days before they returned to normal being 3¼, the earliest being on the second day, and the latest on the fourth.

THE SMALL MONONUCLEATEDS decrease markedly in each case. The maximum decrease being on day of operation in two cases, and on day after in three cases.

THE LARGE MONONUCLEATEDS showed a marked increase in four cases. The maximum increase being

in 2 Cases on day after Operation
1 Case " 2nd " " "
1 " " 4th " " "

In one Case there was a slight decrease.

The EOSINOPHILE decreased in every case.

CASE 38. B.M. aged 29, (female), admitted to the Royal Infirmary complaining of a lump in the breast. Patient was otherwise in good health. Patient was chloroformed for about thirty minutes, and an adenoma was dissected out of the breast. Patient made an excellent recovery, wound healing by 1st intention.

NOTES on TEMPERATURE. The night after operation, the temperature was 99°, and again on day after operation, then it came down to normal and rose to its maximum on the fourth day after operation 99.4°, settling down at normal on the sixth day after operation.

THE BLOOD (a) The Red Blood Corpuscles shewed a decrease of half a million on day after operation. (b) The Leucocytes reached their maximum four hours after operation as did the Polymorph percentage, returning practically to normal on the third day, although the polymorphs remained slightly high. The Small Mononucleateds shew a marked decrease after operation, especially on day of operation, while the Large Mononucleateds were considerably increased, as were the Transitionals. The Eosinophiles decreased after operation, especially in their absolute numbers.

The curves shew a peculiarity, the temperature curve not reaching its maximum till after the total /

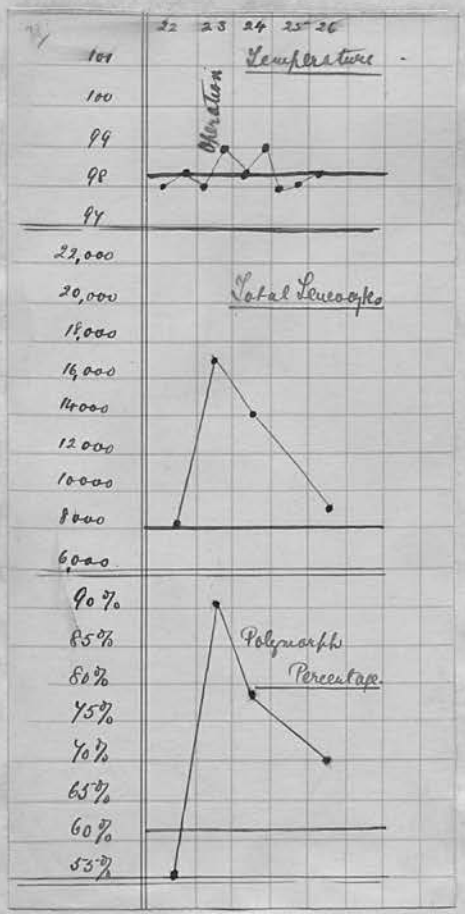
total leucocyte curve and polymorph percentage curve had returned to normal on the fourth day, the blood curves reaching their maximum on day of operation, and returning to normal on third day.

BLOOD EXAMINATION and DIFFERENTIAL PERCENTAGE.

		Red	Leu.	Poly.	S.M.	L.M.	T.	E.
22.12	1PM.	4800000	8000	55	40.25	2	0.75	2
23.12	11AM.	Operation.						
23.12	4PM.	4500000	16800	90.25	6	3	0.5	0.25
24.12	1PM.	4300000	14000	78	16.25	3.5	1.5	0.75
26.12	1PM.	-	9000	70	24	3.75	1	1.25

GLYCOGEN REACTION and ABSOLUTE DIFFERENTIAL.

	Total	Poly.	S.M.	L.M.	T.	E.	
22	8000	4400	3220	160	60	160	Negative.
23	16800	15162	1008	504	84	42	Negative.
24	14000	10920	2275	490	210	105	Negative.
	9000	6300	2160	337	90	113	Negative.



CASE 39. Mrs T. aged 46, noticed a swelling in the breast for three weeks prior to admission to the Royal Infirmary. Patient was a healthy, rather stout woman; she was chloroformed for about forty minutes, and several cysts were removed. (cystic - adenomata). Patient made an excellent recovery, wound healing by 1st intention.

NOTES on the TEMPERATURE. The temperature rose above normal on day after admission (menstruation was going on) and on day after operation, when it was 99°.

THE BLOOD. The Leucocytes, two hours after operation, reached 24,000, with a polymorph percentage of 88. By the second day after operation, the polymorph percentage (60) was below its former normal, while the total leucocytes still remained high. This increase was largely due to a considerable increase in the absolute number of the Small Mononucleateds. By the sixth day after the operation, the total leucocytes had fallen below their former normal, and the polymorph percentage was slightly up, while the Small Mononucleateds had also returned to their normal. The Large Mononucleateds in absolute numbers, increased after the operation, reaching their maximum on second day after operation. The Transitionals were variable. The Eosinophiles were not seen on day of operation, but were increased thereafter.

The /

THE CURVES were of interest, shewing the slight rise of the temperature curve the day after operation, and the fact that the polymorph percentage curve returned to normal, sometime before the total leucocyte curve.

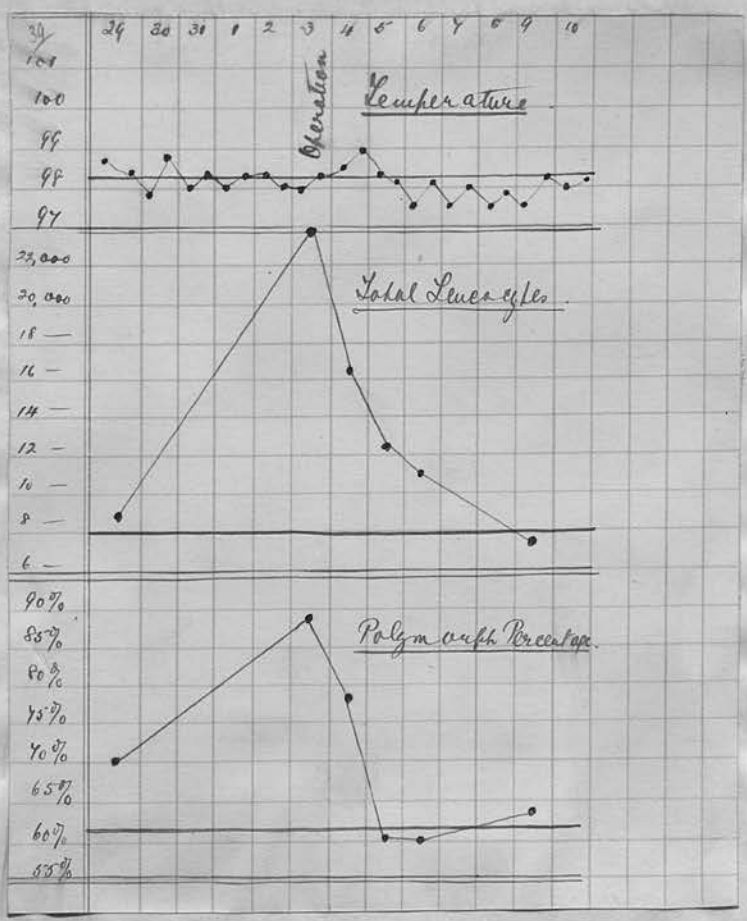
BLOOD EXAMINATION and PERCENTAGE DIFFERENTIAL.

		Leuc.	Poly.	S.M.	L.M.	T.	E.
29.12	4PM.	9000	70	25	3.75	1	0.25
3.1	1PM.	Operation.					
3.1	4PM.	24000	88	9	2	1	-
4.1	4PM.	16400	77	20	2	0.5	0.5
5.1	1PM.	12200	60	32	6	-	2
6.1	4PM.	11200	60	32	6	1	1
9.1	1PM.	7800	64	29.5	5	0.5	1

GLYCOGEN REACTION and ABSOLUTE DIFFERENTIAL.

	Leuc.	Poly.	S.M.	L.M.	T.	E.	
29	9000	6300	2250	337	90	23	Negative.
3	24000	21120	2160	480	240	-	Negative.
4	16400	12628	3280	328	82	82	Negative.
5	12200	7320	3904	732	-	244	Very faint 1st stage.
6	11200	6600	3520	660	110	110	Negative.
9	7800	4992	2301	390	39	78	Negative.

The operation was put off because Menstruation came on night before operation was to have been.



SUMMARY of NON-MALIGNANT BREAST CASES. (2.)

TEMPERATURE. The maximum in each case was 99°, - this was recorded in one case on day of operation, in another on the day after. In both cases the return to normal was on the 2nd day giving an average time when the temperature was above normal of 1½ days.

BLOOD.

LEUCOCYTES. The maximums were respectively 17,000 and 24,000 being an increase of 9.000 and 15,000. In both cases this maximum was reached on day of operation. In the first case the return to normal was on the third day, and in the second on the sixth day.

POLYMORPHS.

The maximums were 90% and 88% being an increase of 35% and 18%. In each case this maximum was recorded on day of Operation, and in one case, the return to normal was on the third day, and in the other on second day.

SMALL MONONUCLEATEDS,

were decreased in both cases, the greatest decrease was on day of operation.

LARGE MONONUCLEATEDS,

were increased, in both cases the greatest increase was on day of Operation.

THE EOSINOPHILES were decreased.

C. S E R I E S .

Where there was considerable Hoemorrhage.

CASE 40. Mrs.L. aged 47, who had breast amputated and axilla cleared out for Carcinona two years ago, now complains of recurrent nodules and some more enlarged glands in the axilla. Patient has otherwise had good health. The nodules were removed, and the axilla cleared out again under Ether, 6 Ozs. (65 minutes.) Wound healed fairly well. The axilla was drained and there was some slight discharge which was aseptic.

NOTES ON TEMPERATURE. The maximum 99° was reached on the night after the operation, falling next day to normal and remaining there.

THE BLOOD. The Leucocytes reached their maximum four hours after operation, as did the Polymorphs. The day after operation they had almost returned to normal, and on the third day, they were quite down to normal.

THE SMALL MONONUCLEATEDS were considerably reduced both in percentage and absolute numbers, especially on day of operation.

THE LARGE MONONUCLEATEDS were much increased on the day after operation, as were the Transitionals./

Transitionals.

THE EOSINOPHILES were decreased, especially on day of and day after operation.

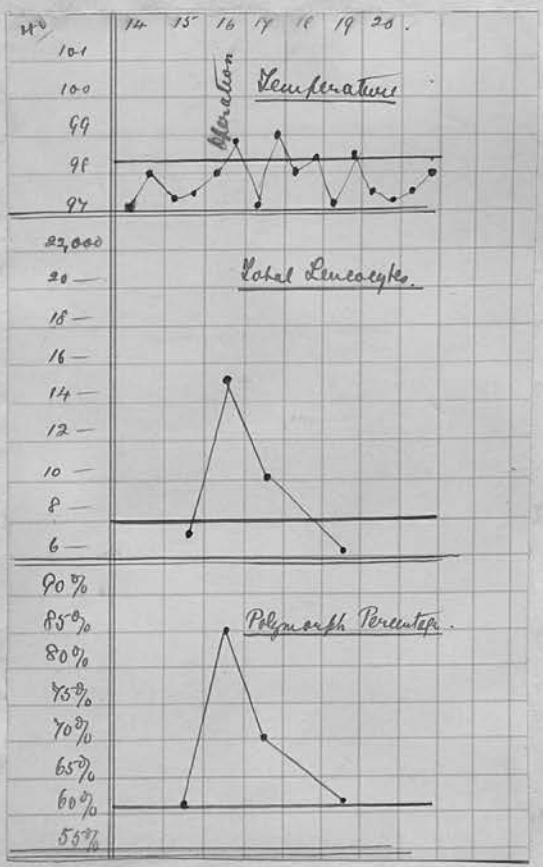
THE CURVES. The total leucocyte curve and the polymorph percentage curve reach their maximum four hours after operation, while the temperature curve does not do so till the next day, while all three curves are at normal on the third day.

BLOOD EXAMINATION & DIFFERENTIAL PROPORTIONAL.

	LEU.	POLY.	S.M.	L.M.	T.	E.
15.12.1.PM.	7200	61	33	3	0.5	2.5
16.12.11.AM.	Operation.					
16.12.4.PM.	14800	85	11	3	0.75	0.25
17.12.1.PM.	10000	70	22	6	1.75	0.25
19.12.1.PM.	6500	62	28	6.5	1.5	2.

GLYCOGEN REACTION & ABSOLUTE DIFFERENTIAL.

	Leuc.	Poly.	S.M.	L.M.	T.	E.	
15.	7200	4392	2376	216	36	180	Negative
16.	14800	12580	1628	444	111	37	"
17.	10000	7000	2200	600	175	25	"
19.	6500	4030	1820	423	97	130	"



CASE 41. J.F. aged 35 was admitted to the Royal Infirmary complaining of a lump in the breast which had lasted for some months. Patient was a healthy young woman. The breast was amputated and the glands in the axilla cleared out under Chloroform operation lasting 75 minutes. Patient made an excellent recovery, wound healing by first intention.

NOTES on the TEMPERATURE. The maximum 99.8° was reached on night of operation. Then two days after operation the temperature was 99.2° falling next day to normal.

THE BLOOD. The maximum Leucocyte count was made four hours after operation. The polymorph percentage was greatest then also. On the third day after operation they had again come to normal. The Small Mononucleateds were considerably reduced in percentage and slightly in absolute numbers on day of operation and day following. The Large Mononucleateds attained their maximum both in percentage and in absolute numbers the day after operation and were increased in numbers on other days after operation, as were the transitionals.

THE EOSINOPHILES were absent on day of and day after operation, but were present in considerable numbers on third day after operation.

THE CURVES shew that the three (the temperature, total/

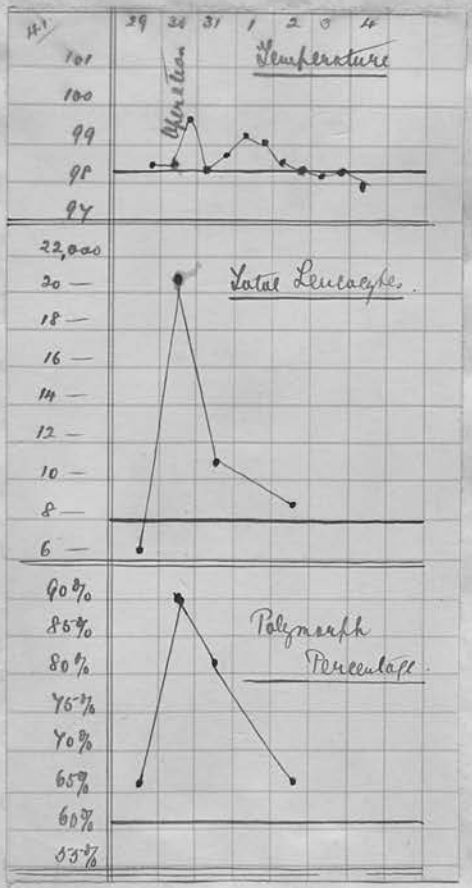
total leucocytes and polymorph percentage) reach their maximum on day of operation and also all three return to normal on the third day.

BLOOD EXAMINATION and DIFFERENTIAL PERCENTAGE.

	Leuc.	Poly.	S.M.	L.M.	T.	E.
29.12.4Pm.	6400	66	28.5	3	1	1.5
30.12.4Pm.	20600	90	7	2.5	0.5	
31.13.1Pm.	11200	81.5	12	5	1.5	
2.1. 1Pm.	8800	65.5	27	4.75	0.75	2

GLYCOGEN REACTION and ABSOLUTE DIFFERENTIAL.

	Leuc.	Poly.	S.M.	L.M.	T.	E.	
29	6400	4224	1824	192	64	96	Negative
30	20600	18540	1442	515	103		Very faint positive
31	11200	9128	1344	560	168		Very faint positive
2	8800	5764	2376	418	66	176	Very faint positive



CASE 42. Mrs St. aged 62, was admitted to the Royal Infirmary with a growth on the breast. Patient was very frail. The breast was amputated, and the glands in the axilla cleared out under Chloroform, operation lasting nearly an hour. Patient bore the anaesthetic very badly, but improved rapidly after operation was finished, and was not sick. Wound healed by 1st intention, and patient seemed a good deal stronger two weeks after the operation, than she was, prior to it.

NOTES on the TEMPERATURE. The temperature which rose to 98.8° on evening of operation, attained its maximum 99.4°, two days after operation, coming down to normal on fourth day, and remaining there.

THE BLOOD. (a) The Red Blood Corpuscles shewed a slight decrease on day of, and day after, operation. There was no poikylocytosis.

(b) The Leucocytes reached their maximum four hours after operation, returning to normal on third day, and shewing a slight rise on fifth day. The Polymorphs, which, previous to operation, were in large numbers 80%, attained their maximum four hours after operation, and on fifth day after operation, they had fallen considerably below their former percentage.

The small Mononucleateds were slightly decreased in absolute numbers the day after operation, while the Large /

Large Mononucleateds were greatly increased on day after operation, as were the Transitionals. Eosinophiles were absent on the day of, and day after operation.

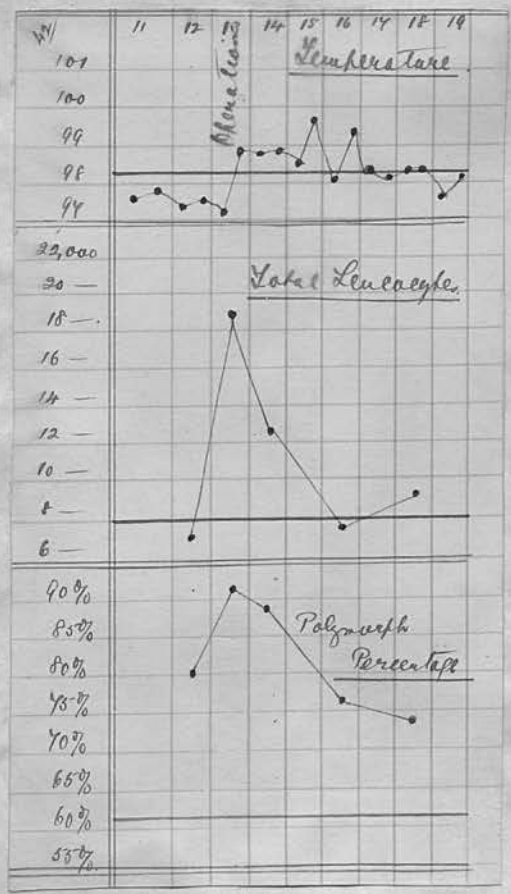
THE CURVES. The total Leucocyte curve and the Polymorph percentage curve, reached their maximum four hours after operation, while the temperature did so, two days after operation. By the third day, the blood curves had returned to normal, while the temperature did so, on the fourth day.

BLOOD EXAMINATION and PROPORTIONAL DIFFERENTIAL.

		R.	Leuc.	Poly.	Sm.M.	L.M.	T.	E.
12.1	1PM.	4400000	7200	80	15.5	2	1	1.5
13.1	11AM.	Operation.						
13.1	4PM.	4200000	18600	91	7.5	1.5	-	-
14.1	1PM.	4100000	12400	88	6	5	1	-
16.1	1PM.	-	7400	76	15	6	1	2
18.1	4PM	-	9400	74	17	6	2	1

GLYCOGEN REACTION and ABSOLUTE DIFFERENTIAL.

	Leuc.	Poly.	S.M.	L.M.	T.	E.	
12	7200	5760	1116	144	72	108	Negative.
13	18600	16926	1395	279	-	-	Negative.
14	12400	10912	744	620	124	-	Negative.
16	7400	5624	1110	444	74	148	Negative.
18	9400	6956	1598	564	188	94	Negative.



CASE 43. A.T. aged 39, female, was admitted to the Royal Infirmary, complaining of a small growth in the right breast, which she had noticed for six weeks. Patient was not at all emaciated and seemed in good general condition. The breast was amputated and the axillary glands and fat cleared out under Chloroform, the Operation lasting about an hour. Patient was not sick after the operation, and made an excellent recovery, the wound healing by first intention.

NOTES on the TEMPERATURE. There was no rise of temperature till the second day after operation, when it rose to the maximum 100°; this was repeated the next day, and then on fourth day it came down to normal, but did not settle down till the seventh day after operation.

THE BLOOD. The Leucocytes and the Polymorph percentage reached their maximum four hours after operation, the absolute count of the polymorphs being a very high one, 22,448. Next day, both had fallen considerably, and by the third day after operation the polymorphs had returned to normal, while the total leucocytes were almost back, and on the next count, (sixth day) the total of leucocytes was a good deal below the normal. The small Mononucleateds were greatly decreased, both in percentage and in absolute numbers/

numbers, four hours after operation, gradually returning thereafter, towards their former number.

THE LARGE MONONUCLEATEDS were greatly increased both in percentage and absolute numbers, especially on day of and day after operation. There were very few transitionals at any time, and Eosinophiles were seen only on three occasions, as were Mast cells.

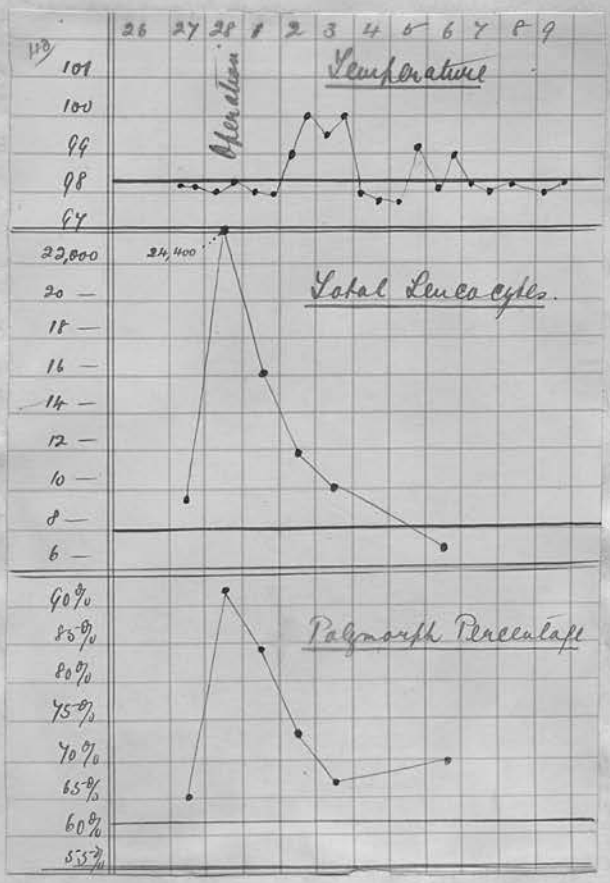
THE CURVES. The temperature curve was at its maximum on the second and third days after operation, by which time the total leucocyte curve and the polymorph percentage curve (which had reached their maximum four hours after operation - 100^0) had fallen considerably, and were almost at normal. Then on fifth and 6th days there was again a slight rise of the temperature curve, while the blood curves were low, especially the total leucocyte one.

BLOOD EXAMINATION & PROPORTIONAL DIFFERENTIAL.

		POLY.	S.M.	L.M.	T.E.	M.
27.2.1.PM.	9600	65	33.5	0.5	- 0.5	0.5
28.2.11 AM.	Operation					
28.2. 4 PM.	24400	92	4.75	3.0	- 0.25.	-
1.3. 4 PM.	16900	84	10.75	5.0	- -	0.25.
2.3. 1 PM.	11800	73.75	21. 0	5.0	- 0.25	-
3.3. 4.PM.	10000	67	27.00	5.0	1 -	-.--.
6.3. 1.PM.	6800	70	27.75	2.0	- -	0.25.

GLYCOGEN REACTION & ABSOLUTE DIFFERENTIAL.

		Poly.	S.M.	L.M.	T.	E.	M.	
27.	9600	6240	3216	48	-	48	48	Negative
28.	24400	22448	1159	732	-	61	-	"
1.	16000	13440	1720	800	-	-	40	"
2.	11800	8703	2478	590	-	29	-	"
3.	10000	6700	2700	500	100	-	-	"
6.	6800	4760	1887	136	-	-	17	"



CASE 44. Mrs C. aged 53 was admitted to the Royal Infirmary complaining of a small lump in the right breast, which had been noticed for a few months. Patient was in good general health. Ether was administered for about an hour, and the breast was amputated and the axillary glands cleared out. Patient was not sick after the operation, and made an excellent recovery, wound healing by first intention.

NOTES on the TEMPERATURE. The temperature rose the day after operation to 100^{0} then fell to normal and rose again the day after operation to 99.4^{0}, coming down to and remaining about normal on the third day after operation.

THE BLOOD. A. THE RED BLOOD CORPUSCLES here show a progressive decrease after the operation. This is of special interest, as the anaesthetic used was Ether. Four hours after operation the corpuscles had fallen by 360,000, and on the fourth day after operation, they had decreased 720,000 from original figures. There was no special alteration in the shape or size of the corpuscles.

The Hoemoglobin scarcely varied at all in percentage, being always about 85., although it varied slightly absolutely.

The LEUCOCYTES and the POLYMORPH reached their/

their maximum four hours after the Operation, the total leucocyte count being the highest recorded in a breast case. Next day both had fallen considerably, and on the third day, the polymorph percentage had returned to normal, and the total leucocytes did so on the fourth day, the polymorphs falling much lower than they were previous to the operation.

THE SMALL MONONUCLEATEDS, although they fell greatly in percentage, varied very little in absolute numbers, being at their maximum on the sixth day after operation.

THE LARGE MONONUCLEATEDS on the other hand, were markedly increased, both in percentage, and in absolute numbers, the Transitionals varying considerably.

THE EOSINOPHILES which prior to operation were only in very small numbers, were not seen on the day of operation, but on subsequent occasions, they were considerably increased. Mast cells were present on five out of the six occasions, in small numbers.

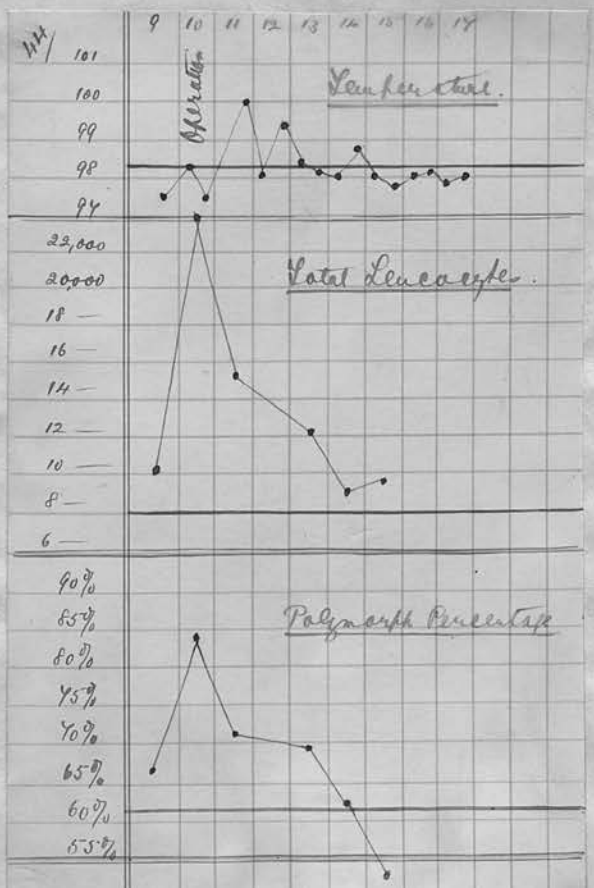
THE CURVES. While the total leucocyte curve and the polymorph percentage curve reached their maximums four hours after operation, the temperature curve did not do so till the day after the operation. It, however, along with the polymorph percentage curve returned to normal on the third day after operation, while the total leucocyte curve did not do so till next day.

BLOOD EXAMINATION & PROPORTIONAL DIFFERENTIAL.

		RED	HB.	LEU.	POLY	SM.	L.M.	T.	E.	M.
9.3.	1.PM.	4920000	85%	10000	67	29	3.5	-		
									0.25	0.25
10.3.	4.PM.	4560000	85%	24800	84	12	2.75	1.		
							-			0.25
11.3.	12.Nn.	4450000	85%	15300	71	21	7.		0.75	
							0.25.	-		
13.	1.PM.	4310000	85%	12000	69	25.5	3.75		.0.25	
							1.00		0.5	
14.	3.PM.	4200000	85%	9000	62	31	5.25		-	
							1. 5		0.25	
16.	1.PM.	-	-	9800	50.5	45	1.5		0.5	
							2.		0.5	

GLYCOGEN REACTION & ABSOLUTE DIFFERENTIAL.

	LEU.	POLY.	S.M.	L.M.	T.	E.	M.	
9	10000	6700	2900	350	-	25	25	NEGATIVE
10	24800	20832	2976	682	248	-	62	"
11	15300	10863	3213	1071	114	39	-	"
13	12000	8280	3060	451	30	120	60	"
14	9000	5580	2790	472	-	135	23	"
16	9800	4949	4410	147	49	196	49	"



CASE 45. T. L. aged 65 (male) has the fore finger of the left hand amputated for Melanotic Sarcoma. He again sought admission to the Royal Infirmary with secondary growths in the axilla. Patient was not emaciated and appeared to be in good general health. The axilla was cleared out under (1) Ethyl Chloride (2) Chloroform and Ether mixture, the operation lasting about 35 minutes. Patient made a good recovery.

NOTES ON TEMPERATURE. Both before and after the operation, the temperature was subnormal. The maximum 98° was reached on the night of the operation.

THE BLOOD.

A. The Red Blood Corpuscles scarcely varied either before or after operation.

B. The Leucocytes reached their maximum the day after operation, while the polymorph percentage did so 3 hours after operation. On the 3rd day the leucocytes had fallen below their own normal, and the polymorph had returned to about normal.

THE SMALL MONONUCLEATEDS were decreased each count after operation, especially 3 hours after it. THE LARGE MONONUCLEATEDS were increased on day after operation, while they were decreased on other days as were the TRANSITIONALS. THE EOSINOPHILES were also decreased 3 hours after operation. The Mast cells were /

were present on each occasion.

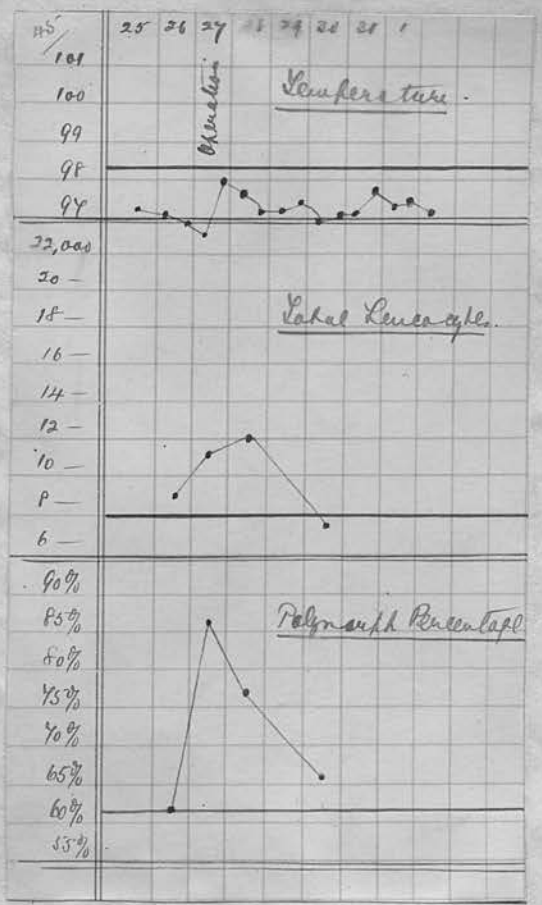
THE CURVES. While the Leucocyte curve shews only a rise of 3,000 and the temperature curve does not rise above normal, the polymorph percentage shews a rise of 25%. The blood curves return to normal on the 3rd day after operation.

BLOOD EXAMINATION & DIFFERENTIAL PERCENTAGE.

		RED	B.C.	LEU.	POLY.	S.M.	L.M.	T.	E.	M.
26.1	3 Pm.	4350000		9000	61.5	30	4	1	3	0.5
27.1	11 Am	Operation								
27.1	3 Pm	4400000		11200	86.5	9.5	3	-	0.5	0.5
28.1	12 Nn	-		12000	77	16	5	0.5	1	0.5
30.1	12 Nn			7,200	66	28	4	0.25	1.5	0.25

GLYCOGEN REACTION & ABSOLUTE DIFFERENTIAL.

	LEU.	POLY.	S.M.	L.M.	T.	E.	M.	
26	9000	5535	2700	360	90	270	45	negative
27	11200	9688	1064	336	-	56	56	"
28	12000	9240	1920	600	60	120	60	"
30	7200	4752	2016	288	18	108	18	"



CASE 46. M. B. aged 31 (female) was admitted to the Royal Infirmary with a simple Goitre, which had been noticed 3 years previously. Patient was otherwise a healthy young woman. The Goitre was removed under Chloroform, operation lasting about an hour. Patient made an excellent recovery. It was not possible to completely close the wound but the bit soon closed up.

NOTES ON TEMPERATURE. The temperature rose to its first maximum, 100°, on evening of operation, then gradually came downwards till the 3rd day when it rose to 100.6°; then on 4th day it reached 100.8°, coming down to normal on 7th day. At no time was there any suspicion of sepsis.

THE BLOOD. It was unfortunately impossible to take a count here 4 hours after operation, so the first count was on day after operation.

A. The Red Blood Corpuscles were practically the same before and after operation.

B. The Leucocytes, which on day after operation were 13,000, fell back to their normal on the 3rd day after operation. The Polymorph percentage which had been very low previous to operation rose by 33 on day after operation, returning to an ordinary figure on the 3rd day.

THE/

THE SMALL MONONUCLEATEDS were considerably decreased after operation, especially on the day after, while THE LARGE MOMONUCLEATEDS were increased on 1st & 2nd days after operation, and on the 3rd day had diminished. THE EOSINOPHILES were absent on day after operation and had markedly increased on the third day.

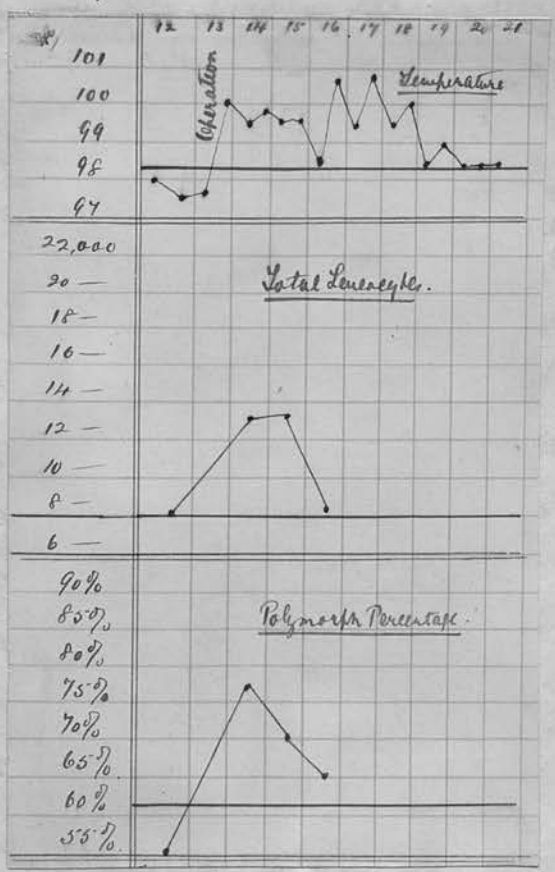
THE CURVES. This case is of interest as the temperature curve remains high for several days after the blood curves have returned to normal.

BLOOD EXAMINATION & DIFFERENTIAL PERCENTAGE.

		RED B.C.	LEU.	POLY.	S.M.	L.M.	T.	E.
12.12	4 Pm	5100000	8000	43.5	50	5	0.5	1
13.12	11 Am	Operation						
14.12	4 Pm	5000000	13000	76.5	17.5	6	-	-
15.12	4 Pm	-	13000	70	23	5	1	0.5
16.12	4 Pm	-	8600	65	30	1.5	1	2.5

GLYCOGEN REACTION & ABSOLUTE DIFFERENTIAL.

	Leuc.	Poly.	S.M.	L.M.	T.	E.	
12	8000	3480	4000	400	40	80	negative
14	13000	9945	2275	780	-	-	"
15	13000	9100	2990	650	195	65	v. faint 1st Stage
16	8600	5590	2580	129	86	215	v. " " "



SUMMARY OF MALIGNANT BREAST CASES etc.

THE TEMPERATURE.

The average maximum was 99.4°
" lowest " " 98°
" highest " " 100.

The maximum was on the day of operation in 3 cases
1st " after " in 1 case
2nd " " " in 3 cases.

The temperature returned to normal

on 2nd day after operation in 1 case
3rd " " " in 2 cases
4th " " " in 3 "

There was a secondary rise in one case (Goitre). The time the temperature was above normal averaged 2½ days.

THE BLOOD.

The Leucocytes averaged

prior to operation	8,500
maximum after "	18,300
Gain	9,800.

The lowest maximum was 12,000; the highest 24,800.

The maximum was reached on day of operation in 5 cases, and on day after operation in 2 cases (in one of which, it was impossible to get a specimen the day of operation). In 6 cases the leucocyte returned to normal on the 3rd day after operation and in the 7th case on the 4th day.

THE/

THE POLYMORPHS averaged

	prior to operation	63%
maximum after	"	86%
	Gain	23%

The lowest maximum being 76%; the highest 92%.

In 6 cases the maximum was recorded on the day of operation, and in the 7th it was impossible to get a specimen on day of operation.

The averaged number of days before they returned to normal was 2.7; the earliest being on the 1st day and the latest on the 3rd day.

THE SMALL MONONUCLEATEDS.

decrease markedly in each case, the maximum decrease in 5 cases being on day of operation, in 2 cases being on day after operation.

THE LARGE MONONUCLEATEDS.

increased in every case, the maximum increase being noted in every case on day after operation.

THE EOSINOPHILES decreased in every case after the operation.

CASE 47. J. B. aged 47 (male) was admitted to the Royal Infirmary with a Tuberculous knee. This had been troubling him for 3 years. Patient was rather thin but appeared otherwise in good health. Under Chloroform the knee was completely excised, no nails being put in, the operation lasting about 45 minutes. Patient made an excellent recovery, wound healing by first intention, with bones in good position.

NOTES ON TEMPERATURE. The maximum 100.6° was reached on 2nd day after operation, then on 4th & 5th days it reached 100.4° coming down to normal on the 7th day.

THE BLOOD. The Leucocytes which attained their maximum 4 hours after operation, had returned practically to normal on the 3rd day and on the 6th day were considerably below their former figure. The polymorph percentage also was at its greatest 4 hours after operation but did not return to normal till the 6th day after operation, when in absolute numbers they were considerably below their former average.

THE SMALL MONONUCLEATEDS were reduced in percentage & absolute numbers each day, especially on the day after/

after operation while THE LARGE MONONUCLEATEDS were increased in number after operation, especially on the day after operation. THE TRANSITIONALS were variable. THE EOSINOPHILES also were variable being absent on day of operation and on 3rd day after operation and being fairly abundant on 2nd day.

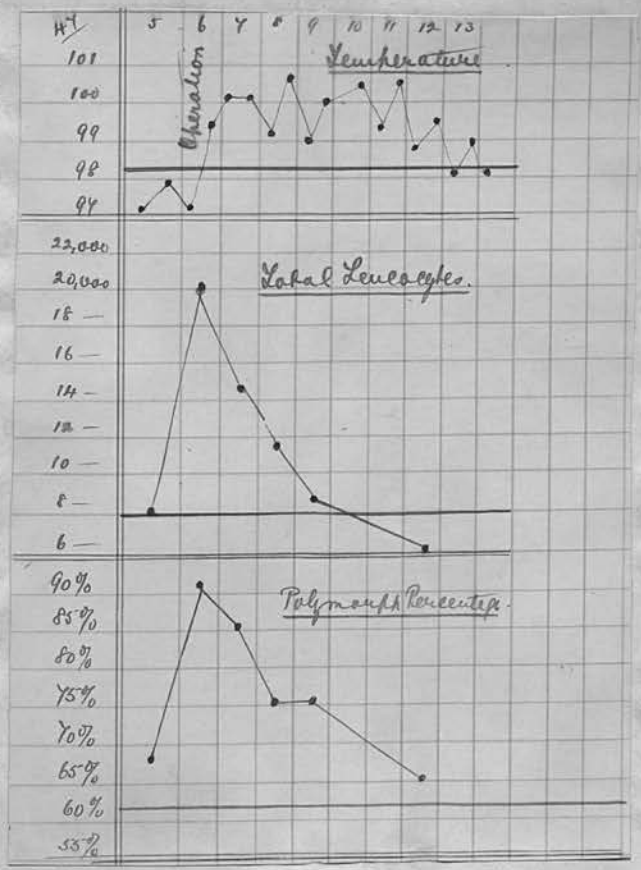
THE CURVES. The Leucocyte curve and the polymorph percentage curve both reach their maximum 4 hours after operation, while the temperature curve does not do so till 2 days after the operation. The Leucocyte curve is the first to return to normal, then the polymorph percentage curve and lastly the temperature.

BLOOD EXAMINATION & DIFFERENTIAL PERCENTAGE.

		LEU.	POLY.	S.M.	L.M.	T.	E.
5.12	4 Pm	8000	68	27	3	1	1
6.12	11 Am	Operation					
6.12	4 Pm	20000	91	7.5	1.5	-	-
7.12	4 Pm	14600	85	8.5	5.5	0.5	0.5
8.12	4 Pm	11600	75.25	15.75	6.5	0.5	2
9.12	4 Pm	8800	75.5	15.25	8.5	0.75	-
12.12	4 Pm	6000	65	26.5	7.5	0.75	0.25

GLYCOGEN REACTION & ABSOLUTE DIFFERENTIAL.

	LEUC.	POLY.	S.M.	L.M.	T.	E.	
5	8000	5440	2160	240	80	80	negative
6	20000	18200	1500	300	-	-	very faint positive
7	14600	12410	1241	803	73	73	" " "
8	11600	8729	1827	754	58	232	negative
9	8800	6644	1342	748	66	-	
12	6000	3900	1590	450	45	15	very faint positive



CASE 48 N. C. aged 26 (male) was admitted to the Royal Infirmary with a tuberculous knee which had troubled him for 6 years. Patient was robust & in good general health. The joint was excised under Chloroform and nailed in position, operation lasting about ¾ of an hour. Patient did fairly well although there was some slight irritation around the nail holes, but the temperature persisted high for several weeks and about 4 weeks after the operation a pocket of caseated material was found and drained and afterwards scraped. This appeared to be purely tuberculous in nature.

NOTES ON TEMPERATURE. Prior to operation the temperature ranged between 97° & 99.4°. After operation it rose to 99.6° on the 4th day and to 100.2° on the 7th day, thereafter continuing fairly high & oscillating.

THE BLOOD. This was the only case in which it was impossible to take a count previous to operation. The standard of the others has been taken of 8,000 leucocytes & 61% polymorphs.

A. The Red Blood Corpuscles after operation varied very slightly between 4,900,000 & 5,100,000.

B. The Leucocytes reached their maximum 4 hours after operation, and on the 3rd day they had nearly returned to normal, but rose again on the 4th day, coming/

coming down to absolute normal on the 10th day. On the 7th day when the temperature was at its maximum they were only slightly above normal. The polymorph percentage was also at its maximum 4 hours after operation & returned practically to normal on the 4th day, remaining thereabouts till the last count.

THE SMALL MONONUCLEATEDS were at their minimum in absolute numbers on the 3rd day after operation, and in percentage 4 hours after operation. THE LARGE MONONUCLEATEDS reached their maximum 4 days after operation. THE EOSINOPHILES varied considerably, being absent on day after operation and reaching 3% on 4th day after operation.

THE CURVES shew the primary maximum of the temperature curve on the day after operation, and the 2nd maximum on the 7th day after operation, remaining oscillating thereafter.

Both the leucocyte curve and the polymorph percentage curve attained their maximum on day of operation; the polymorph percentage first returning to normal, and the leucocyte curve after a slight rebound, finally reaching normal on the 10th day.

The temperature in this case had shewn no more variation after operation than it did before till the 4th day, when also we have a rebound in the number of/

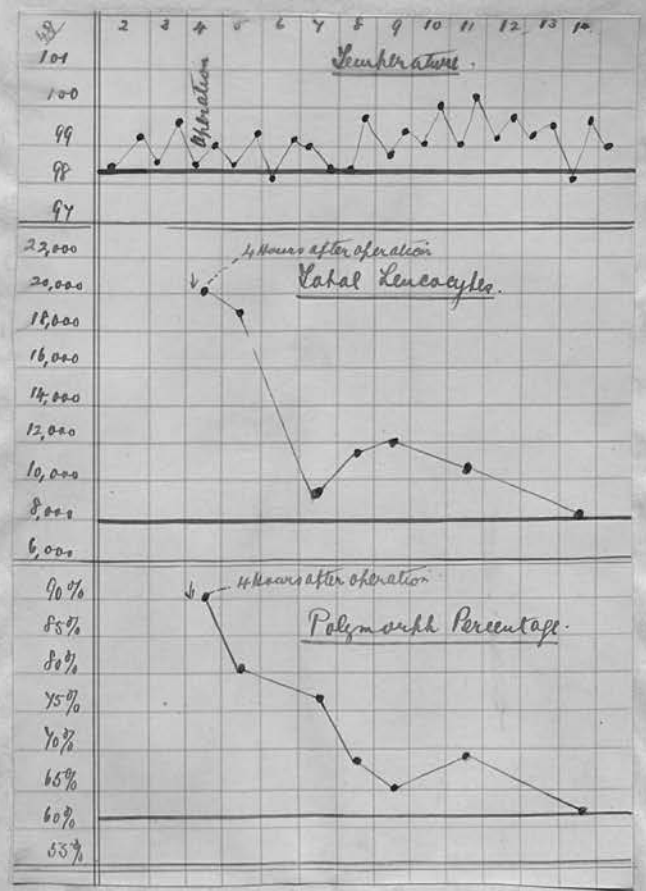
of leucocytes rising from 9,400 to 11,400 & 12,000 on 4th & 5th days, and although the polymorph percentage was still falling, this seems to be an indication along with the temperature that there was some septic process as well as the tuberculous at work.

BLOOD EXAMINATION & PROPORTIONAL DIFFERENTIAL.

			REDS	LEUC.					
4.11	11	Am	Operation						
4.11	4	Pm	5100000	20000	90	6.25	2	1.5	0.25
5.11	12	Nn	4900000	19000	80.5	9.5	5.75	4.25	-
7.11	4	Pm	5000000	9400	76.5	12	6.25	4.5	0.75
8.11	4	Pm	-	11600	68.5	18.5	9	1	3
9.11	4	Pm	-	12000	65	25	7	2	1
11.11	4	Pm	-	10500	69	27	2.5	0.5	1
14.11	4	Pm	-	8000	61.75	27.75	6	2	2.5

ABSOLUTE DIFFERENTIAL.

	TOTAL	POLY.	S.M.	L.M.	T.	E.	
4	20000	18000	1250	400	300	50	negative
5	19000	15295	1805	1092	808	-	"
7	9400	7191	1128	588	423	70	
8	11600	7946	2146	1044	116	348	
9	12000	7800	3000	840	240	120	negative
11	10500	7245	2835	262	53	105	
14	8000	4940	2220	480	160	200	negative



CASE 49. Mrs S. age 34 was admitted to the Royal Infirmary with a tuberculous knee which had troubled her for some years. Patient was a thin nervous woman. The knee was completely excised under Chloroform, operation lasting about 45 minutes no nails were put in. Patient was slightly sick after the operation and was very hysterical for two days. After that she got on extremely well the wound healing by first intention with the bones in good position.

NOTES on the TEMPERATURE. The temperature, which had been slightly irregular previous to the operation, rose to 99.8° on the second day after the operation and on the fourth day it reached its maximum 100° coming down slowly thereafter and reaching about normal on the ninth day.

THE BLOOD. Leucocytes. Prior to operation there was a large proportion of Small Mononucleateds. The total of the Leucocytes rose to 18,600 four hours after the operation. From this maximum it fell rapidly and three days after the operation, it had reached its normal. The Polymorph percentage rose by 38 four hours after operation falling rapidly also. The Small Mononucleateds decrease greatly both in percentage and absolute numbers reaching their minimum four hours after operation. The Large Mononucleateds on day after operation had increased greatly/

greatly in absolute and slightly in percentage. The Eosinophiles were decreased after the operation and were absent the day after. Mast cells were not seen after the operation.

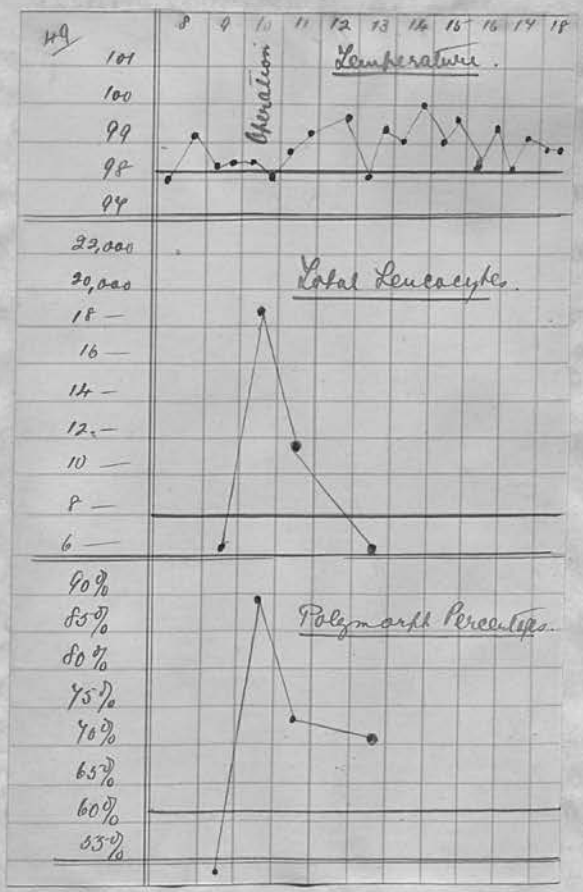
THE CURVES. The leucocyte curve and polymorph percentage reach their maximum four hours after operation while the temperature curve reaches its maximum on fourth day after operation by which time the leucocyte curve and polymorph percentage curve are down again.

BLOOD EXAMINATION and DIFFERENTIAL PROPORTIONAL.

	Leuc.	Poly.	S.M.	L.M.	T.	E.	M.
9.2. 1Pm.	6500	51	42	4.25	0.5	2	0.25
10.2. 3Pm.	18600	89	9	1.75		0.25	
11.2.12N.	11600	73	20	6	1		
13.2. 1Pm.	6500	72	20	7	0.5	0.5	

ABSOLUTE DIFFERENTIAL and GLYCOGEN REACTION.

	Leuc.	Poly.	S.M.	L.M.	T.	E.	M.	
9	6500	3315	2730	276	33	130	16	Negative
10	18600	16554	1674	326		46		Negative
11	11600	8468	2320	696	116			Negative
13	6500	4680	1300	456	32	32		Negative



CASE 50. J. McD aged 11, (male) suffered from Spina Bifida, which caused paralysis of legs. Boy appears fairly healthy. Chloroform was given, and the knee joint was excised. (No nails used.) Patient made an excellent recovery, wound healing by first intention.

NOTES on the TEMPERATURE. The maximum, 100.4°, was reached the day after operation, coming down to normal on fourth day, with a temporary rise to 99.2° on fifth day, and then down to normal once again.

THE BLOOD.- The Leucocytes. This case prior to operation, gave the highest count in the series (15,000). Within four hours after operation, the count rose by 15,000 and the Polymorph percentage by 25, coming down slightly next day, and on the fourth, both the total Leucocytes and the Polymorph percentage returned to normal in this case. The Small Mononucleateds were much reduced in absolute numbers, and in percentage, especially on day after operation. The Large Mononucleateds were diminished on day of operation, rising above their average on first and second days after operation. Transitionals were much increased on day after operation, while the Eosinophiles were absent on day of, and day after operation.

THE CURVES. The total Leucocyte and the Polymorph percentage curves reach their maximum four hours after operation /

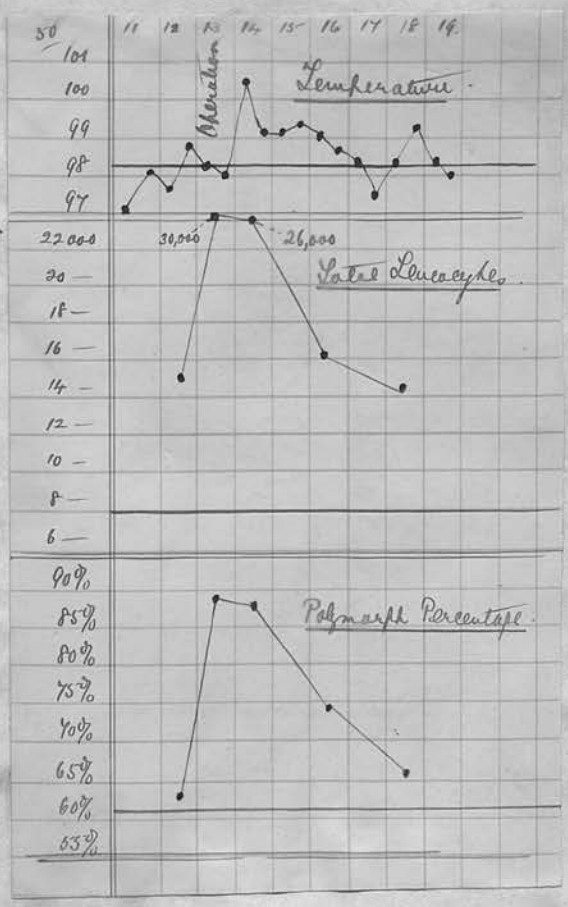
operation, while the temperature curve does not do so till the day after. The blood curves come steadily down, reaching their normal on fifth day, while the temperature curve has a slight rebound and reaches normal on sixth day.

BLOOD EXAMINATION and PROPORTIONAL DIFFERENTIAL.

		Leuc.	Poly.	S.M.	L.M.	T.	E.
12.1	1PM.	15000	63	28	6	1	2
13.1	11AM.	Operation					
13.1	4PM.	30000	88.5	9	2	0.5	-
14.1	NN.	26000	87	6	5	2	-
16.1	1PM.	16400	74	18	7	0.75	0.25
18.1	1PM.	14600	66	31.25	2	0.5	0.25

GLYCOGEN REACTION and ABSOLUTE DIFFERENTIAL.

	Leuc.	Poly.	S.M.	L.M.	T.	E.	
12	15000	9450	4200	900	150	300	Negative.
13	30000	26550	2700	600	150	-	Negative.
14	26000	22620	1560	1300	520	-	Negative.
16	16400	12136	2952	1148	123	41	Negative.
18	14600	9636	4562	292	73	37	Negative.



SUMMARY of EXCISION of KNEE CASES (4)

THE TEMPERATURE. The average of the maximums was 99.7°. The maximum was recorded

in 2 cases on 1st day after operation.
in 2 " " 2nd " " "

The lowest maximum was 99.4°, and the highest was 100.4°.

The temperature returned to normal

in 1 case on 3rd day.
in 2 cases " 4th "
in 1 case " 7th "

The average number of days the temperature was above normal, was 3.75, and there was a secondary rise in two cases.

THE BLOOD. The Leucocytes averaged

prior to operation	9,000
after "	22,000
Gain	13,000

The lowest maximum being 18,500, and the highest, being 30,000.

The maximum was reached on day of operation in each case. The average number of days before the Leucocytes returned to normal being 4½. The earliest being on the third day, and the latest on the seventh.

The /

The Polymorphs averaged

	prior to operation	60%
maximum after	"	89½%
	Gain	29½%

The lowest maximum being 88%, and the highest being 91%.

The maximum was reached on day of operation in each case. The average number of days before the Polymorphs returned to normal, was 4½. The earliest being on the third day, and the latest on the sixth day.

THE SMALL MONONUCLEATEDS decreased in every case.

The maximum decrease being noted

in 1 case on day of operation
in 2 cases " " after "
in 1 case " 3rd " "

THE LARGE MONONUCLEATEDS were increased in each case, the greatest increase being on day of operation in each case.

THE EOSINOPHILES were decreased in each case.

SERIES OF FRACTURE CASES.

CASE 51. J.F. aged 8. on the evening of the 8th January fell and broke both bones of the leg. There was little displacement and it was easily set. Patient was a delicate little boy.

THE TEMPERATURE did not rise above normal.

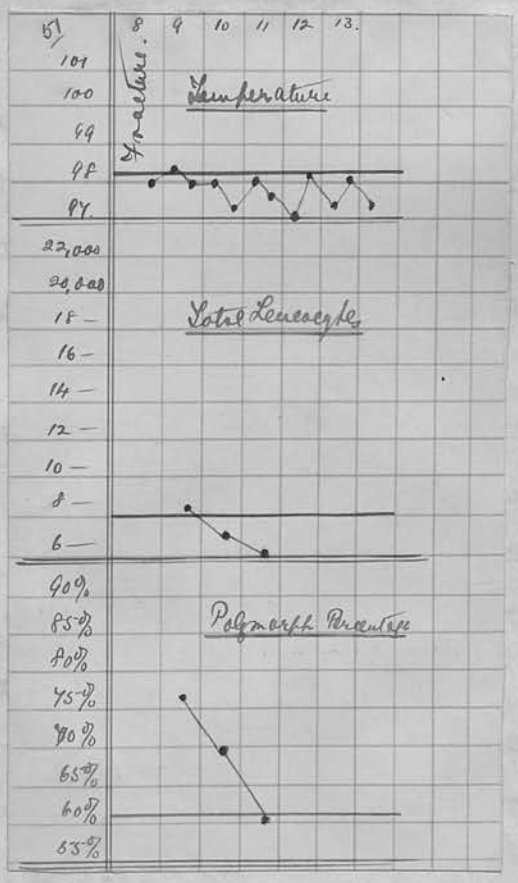
THE BLOOD, which was examined about 18 hours after the fracture shewed practically an ordinary number of leucocytes, however, this number fell the next two days. The Polymorphs shewed a slight increase on the ordinary numbers decreasing also. The Small Mononucleateds increased in percentage the third day and the Large Mononucleateds were increased on the second day while Eosinophiles were present daily.

BLOOD EXAMINATION and PROPORTIONAL DIFFERENTIAL.

	R.	Leuc.					
8.1.7Pm.	Fracture						
9.1.1Pm.	4200000	8400	77	16	5	1	1
10.1.3Pm.		7000	69	19	9.5	1.25	1.25
11.1.3Pm.		6000	60	28	9	1	2

GLYCOGEN REACTION and DIFFERENTIAL ABSOLUTE.

9	8400	6468	1344	420	84	84	Negative
10	7000	4830	1330	666	87	87	Negative
11	6000	3600	1680	540	60	120	Negative



CASE 52. D.D. aged 24 (male), fractured the shaft of the right Femur in the lower third about 7 A.M. on 14th January. There was a good deal of displacement. Patient was in good general health, and the bone united well.

NOTES on the TEMPERATURE. The temperature on night of fracture was 98.4°, rising next day to its maximum 99.6°, coming down gradually and reaching normal on 3rd day after fracture.

THE BLOOD. (a) The Red Blood Corpuscles shewed no variation on the three occasions on which they were counted.

(b) The Leucocytes, about twelve hours after fracture, shewed a slight increase on the normal, falling next day to the normal and then on the fourth day, slightly below it. The Polymorphs also on the first count, were slightly above normal, falling next day and reaching about normal on second day after.

The Small Mononucleateds were at their minimum in percentage on day of fracture, and increased thereafter, while there was very little variation in absolute numbers.

The Large Mononucleateds were increased slightly on day after fracture, and considerably decreased on fourth day after it.

Eosinophiles were present in small percentage on every day /

day, while Mast Cells were found on three occasions, and in fair proportion on the second day after fracture.

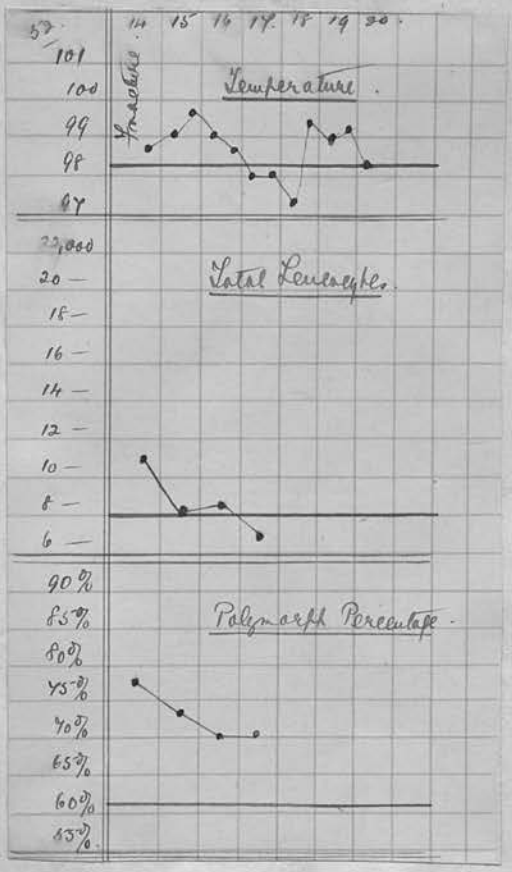
THE CURVES shew the Leucocytes and the Polymorph percentage at their maximum on day of fracture, while the Temperature was at its maximum on the evening after fracture, by which time the blood curves were down.

BLOOD EXAMINATION and PROPORTIONAL DIFFERENTIAL.

		Reds.	Leuc.	Poly.	S.M.	L.M.	T.	E.	M.
14.1	7AM.	Fracture.							
14	7PM.	4900000	11200	77.5	18	3.25	0.75	0.25	0.25
15	3PM.	4900000	8000	73	20.5	5	0.5	0.25	0.75
16	1PM.	4900000	8400	70	24	3.5	0.5	0.5	1.5
18	1PM.	-	6800	70	28	1.25	0.5	0.25	-

GLYCOGEN REACTION & ABSOLUTE DIFFERENTIAL.

	Leuc.	Poly.	S.M.	L.M.	T.	E.	M.	
14	11200	8680	2016	364	84	28	28	Negative.
15	8000	5840	1640	400	40	20	60	Negative.
16	8400	5880	2016	294	42	42	126	Negative.
18	6800	4760	1904	85	34	17	-	Negative.



CASE 53. Mrs B. aged 50. slipped down stairs and twisted her leg under her on the 15th January about 9P.M. fracturing both bones of the leg. Patient was in fairly good general health. There was not much displacement.

NOTES on the TEMPERATURE. The Temperature which was subnormal on admission, rose on the day after to 98.6° and on the fifth day after fracture it went up to 99° coming down immediately thereafter.

THE BLOOD. A. The Red Blood Corpuscles shew no variation.

B. The Leucocytes on the first three days after fracture were about 10,000 falling on the fifth day to 8,600. The Polymorphs on the first two days were slightly above the normal falling on the third day. The Small Mononucleateds were decreased both in percentage and absolute numbers on the second day after operation on which day the large Mononucleateds were at their maximum decreasing thereafter. Eosinophiles were present only on the second and fourth days and Mast cells only on the first day after fracture.

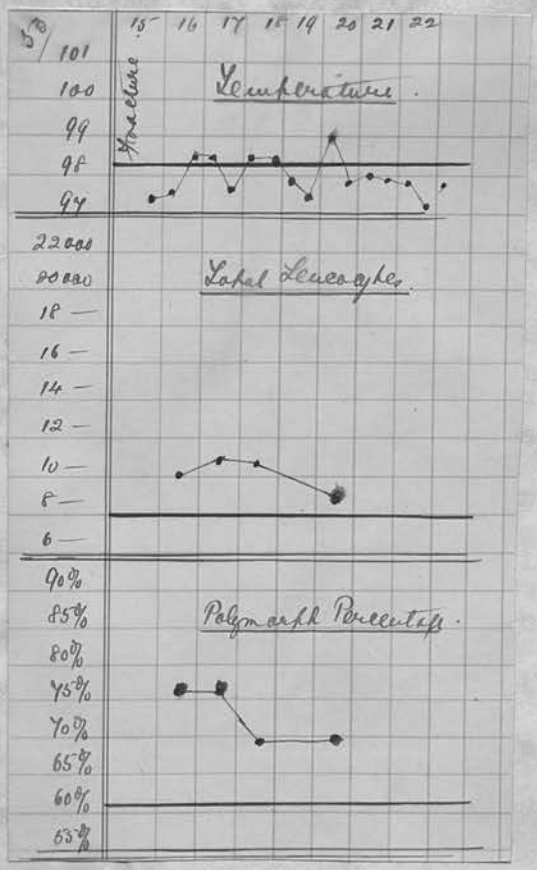
THE CURVES, shew practically no rise either in the temperature or the total leucocyte while the polymorphs shew a slight rise above the ordinary normal and then a fall.

BLOOD EXAMINATION and PROPORTIONAL DIFFERENTIAL.

		R.	Leuc.	Poly.	S.M.	L.M.	E.	M.
15.	9Pm.	Fracture						
16.	3Pm.	4150000	10000	76	20	3 0.5		0.5
17.	3Pm.		10500	76	17	6 1		
18.	3Pm.	4140000	10400	69.5	26	4	0.5	
20.	3Pm.		8600	69	27	3	1	

GLYCOGEN REACTION and ABSOLUTE DIFFERENTIAL.

	R.	Leuc.	Poly.	S.M.	L.M.	E.	M.	
16	10000	7600	2000	300	50		50	Negative
17	10500	7980	1785	630	105			Negative
18	10400	7228	2704	416				Negative
20	8600	5934	2322	258	86	86		Negative



CASE 54. J. McI aged 33, fractured his right Tibia in the lower third about 11P.M. on January 20th. There was not much displacement. Patient was a strong healthy labourer.

NOTES on the TEMPERATURE. The Temperature rose the day after the fracture to 99.2° and continued between 98.4° and 99° for two days thereafter, coming down first to normal and then slightly subnormal on the fourth day after fracture.

THE BLOOD. The day after fracture the total of the Leucocytes was slightly above the normal, falling, however, next day. The Polymorph percentage also was slightly above normal day after fracture, falling to about normal next day, and then on fourth day after fracture coming down below normal.

The Small Mononucleateds were at their minimum on day after fracture, rising daily thereafter, both in percentage and absolute numbers.

The Large Mononucleateds reached their maximum the second day after fracture, falling thereafter, while the Transitionals were also at their maximum that day.

Eosinophiles were present on the three last counts, and Mast Cells were seen daily in variable numbers.

THE CURVES shew the Temperature curve, the Polymorph percentage curve and the total Leucocyte curve, all at their maximum on the day after fracture. The blood /

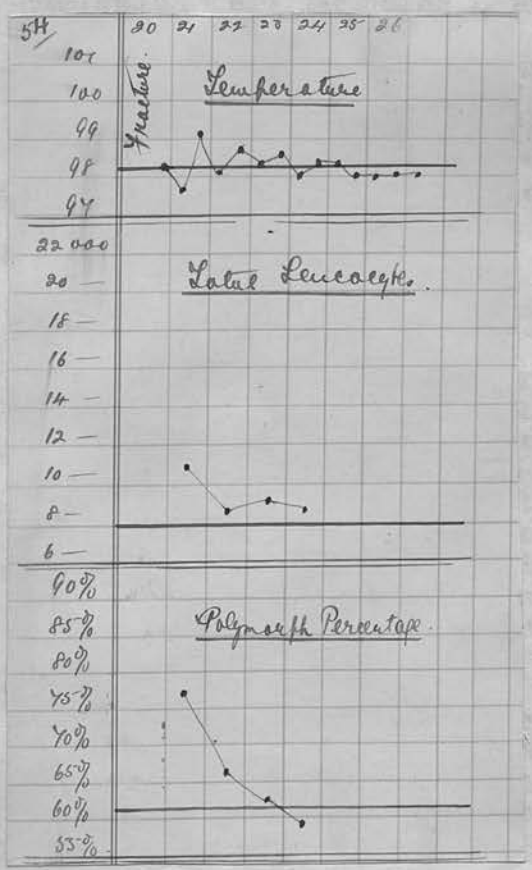
blood curves were the first to come down to an average while the temperature curve came down on the fourth day.

BLOOD EXAMINATION and PROPORTIONAL DIFFERENTIAL.

		Poly.	S.M.	L.M.	T.	E.	M.
20.1	11PM.	Fracture.					
21.1	NN.	10800	77.5	15.5	5.75	0.75	0.5
22.1	3PM.	8800	66.5	21.5	8.75	1 2	0.25
23.1	1PM.	9000	62.5	30	6	- 0.75	0.75
24.1	3PM.	8800	58	36.5	2.5	0.5 2	0.5

GLYCOGEN REACTION and ABSOLUTE DIFFERENTIAL.

	Poly.	S.M.	L.M.	T.	E.	M.	
21	10800	8370	1674	621	81	54	Negative.
22	8800	5852	1892	770	88	176 22	Negative.
23	9000	5626	2700	540	-	67 67	Negative.
24	8800	5104	3212	220	44	176 44	Negative.



CASE 55. J.C. aged 26, sustained a transverse fracture of the left Patella at 1 A.M. on the 21st January. The joint was greatly distended with fluid, which was evidently blood, and the fragments were with difficulty made out. There was also a great deal of extravasated blood in the surrounding parts. Patient was rather thin but seemed to be in good general health. It was decided to wire the fragments. This was done 3½ days after the fracture under (1) Chloroform and (2) Ether, lasting 65 minutes. Patient got on remarkably well.

NOTES on the TEMPERATURE. The temperature which was 98.8° on admission fell to below normal the same day, rising on the next day to 99.2° then coming down to normal till after the operation. The evening of the operation it reached 99.6° coming back to normal on the 2nd day after operation.

THE BLOOD.

A. The Red Blood Corpuscles shew practically no variation in the three occasions on which they were counted.

B. The Leucocytes 11 hours after fracture were 9,400, coming down on the two following days. The Polymorph percentage on the first count was practically the same, and there was only a slight increase in the Small Mononucleateds after the first count, while there was a marked decrease in the large Mononucleateds after the 1st count. After the operation there was a rise of 6,000 in the total leucocytes /

leucocytes reaching their maximum on the day after operation, with a marked increase in the Polymorph percentage the same day. The small Mononucleateds were decreased in percentage, but shewed only a slight change in their absolute numbers, while the large Mononucleateds were much increased on the third day. The Transitionals also which had been very few previously, were considerably increased, and Eosinophiles were not present on day after operation. The Mast Cells were variable.

THE CURVES. With the exception of slight rise on the day after admission, the temperature curve remained steady till after the operation, when it reached its maximum on the day of the operation, while the total Leucocyte curve and the Polymorph percentage curve did not do so till the day after operation. All the three had returned to normal on the second day after operation.

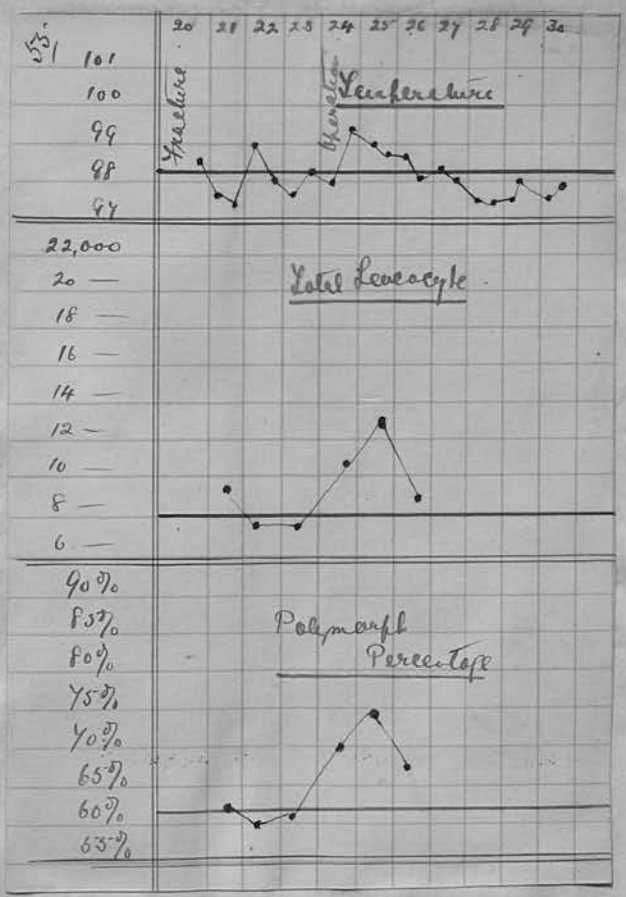
The interest of this case lies in the fact (1) that there was very considerable hoemorrhage into the surrounding parts after the fracture,
(2) that the fracture and operation took place on the same patient. After the fracture, the blood appeared to be in quite a normal condition, yet after the operation, we have the usual changes taking place - a rise to nearly double of the total Leucocytes and an increase in the Polymorphs of more than double their absolute numbers, and of 12½%.

BLOOD EXAMINATION and PROPORTIONAL DIFFERENTIAL.

		Reds.	Leuc.	Poly.	S.M.	L.M.	T.	E.	M.
21.	1Am.	Fracture.							
21.	Nn.	4400000	9400	62.5	27.5	8	0.5	-	1.5
22.	3Pm.	4200000	7400	60.5	37.5	1.5	-	0.5	-
23.	Nn.	-	7000	61.5	35	2.5	0.5	0.5	-
24.	Nn.	Operation							
24.	3Pm.	4300000	10600	70	21	7.5	1	0.25	0.25
25.	3Pm.	-	13000	74	19.5	5.5	0.5	-	0.5
26.	Nn.	-	9400	66.5	25.5	6	1.75	-	0.25

GLYCOGEN REACTION and ABSOLUTE DIFFERENTIAL.

	Leuc.	Poly.	S.M.	L.M.	T.	E.	M.	
21.	9400	5875	2585	752	47		141	Negative.
22.	7400	4477	2775	111	-	37	-	Negative.
23.	7000	4305	2450	175	35	35	-	Negative.
24.	10600	7420	2226	796	106	26	26	Negative.
25.	13000	9620	2535	715	65	-	65	Negative.
26.	9400	6251	2397	564	164	-	24	Negative.



CASE 56. W.S. aged 37 male fractured a Tibia in the lower third about 4P.M. on the 11th February. There was practically no displacement. Patient was a healthy well built man.

NOTES on the TEMPERATURE :- On admission about two hours after the fracture, the temperature was 100.4° coming down to normal next day and rising slightly on the second day and reaching its second maximum 99.8° on the third day after operation: after this the temperature came back once more to normal.

THE BLOOD. The Leucocytes the day after fracture were the highest in the series 13000 coming down on the second day after fracture to about an average and varying slightly thereafter while the Polymorphs at no time exceeded 61%. The Small Mononucleateds varied slightly reaching their maximum on the fourth day after fracture. The Large Mononucleateds were at their maximum on the second day after the fracture while the Transitionals were found on only two occasions. Eosinophiles were absent on the first two counts and Mast cells varied.

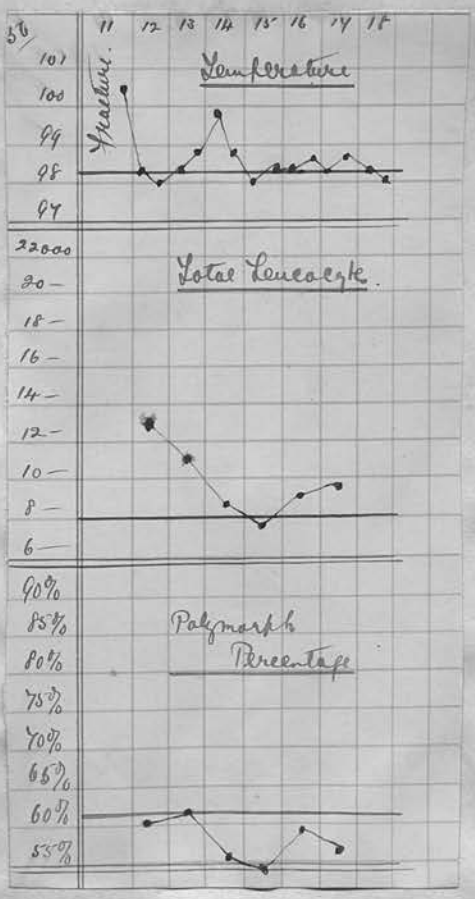
THE CURVES. The total Leucocyte curve was at its maximum when the temperature curve was at normal and had returned to normal when the temperature curve was at its maximum. There was practically no variation in the Polymorph percentage curve.

BLOOD EXAMINATION and PROPORTIONAL DIFFERENTIAL.

11.	4Pm.	Fracture	Poly	S.M.	L.M.	T.	E.	M.
12.	3Pm.	13000	60	37	3	-	-	-
13.	1Pm.	11000	61	33	5.5	-	-	0.5
14.	3Pm.	8600	55	42.75	0.75	0.5	0.5	0.5
15.	4Pm.	7600	53	43	2.5	-	1.5	-
16.	1Pm.	9000	59.25	36	1.5	-	2	1.25
17.	1Pm.	9200	56	37	4.5	0.75	1.5	0.25

GLYCOGEN REACTION and ABSOLUTE DIFFERENTIAL.

		Poly.	S.M.	L.M.	T.	E.	M.	
12	13000	7800	4810	390				Negative
13	11000	6710	3630	605			55	Negative
14	8600	4730	3676	65	43	43	43	Negative
15	7600	4028	3268	190		114		Negative
16	9000	5332	3240	135		180	113	Negative
17	9200	5152	3404	414	69	138	23	Negative



CASE 57. J.D. aged 24. fractured a Tibia about 4P.M.on February 11th. Patient was an athletic young man in good general health.

NOTES on the TEMPERATURE. - On the 5th day after fracture the temperature rose to 99° and remained there for 24 hours coming down on the 6th day after the fracture.

THE BLOOD :- The total number of the leucocyte was 13,000 about 24 hours after the fracture coming down to normal on the third day after fracture and remaining thereabouts. The Polymorph percentage was 70, the day after fracture coming down to normal next day and varying thereabouts. The Small Mononucleateds were at their minimum in percent the day after fracture but they did not vary much. The Large Mononucleateds were in good number daily. The Eosinophiles were absent on day after fracture and varied slightly thereafter. Mast cells were present on five occasions.

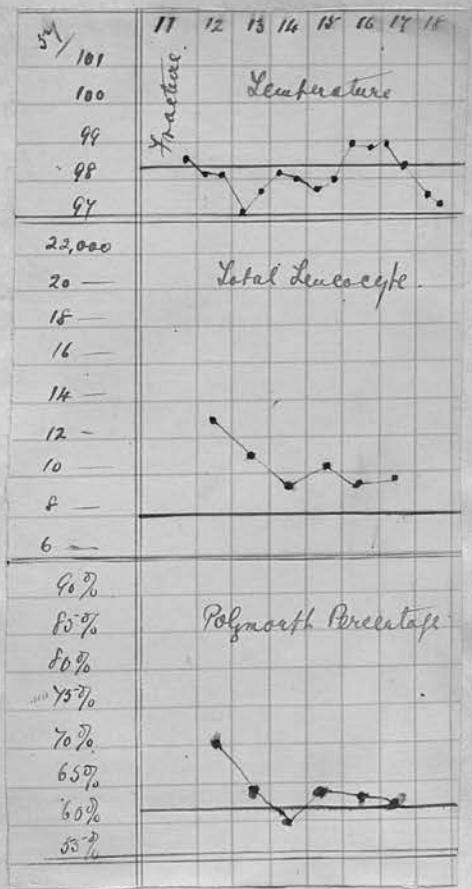
THE CURVES. The Temperature curve did not start to rise till two days after the leucocyte curve was at normal. All three curves were at normal on the sixth day.

BLOOD EXAMINATION and PROPORTIONAL DIFFERENTIAL.

11.4Pm.	Fracture	Poly.	S.M.	L.M.	T.	E.	M.
12.3Pm.	13000	70	23	6.5	0.25		0.25
13.1Pm.	11200	64	27.5	7.5	0.5	0.5	
14.3Pm.	9400	59.5	32	5.5	1.5	0.25	1.25
15.1Pm.	10200	63.5	28	5	2	1.25	0.25
16.1Pm.	9600	62.5	28	7.5	0.5	1	0.5
17.1Pm.	9800	61.5	27.25	7	3	1	0.25

GLYCOGEN REACTION and ABSOLUTE DIFFERENTIAL.

		Poly.	S.M.	L.M.	T.	E.	M.	
12	13000	9100	2990	846	32		32	Negative
13	11200	7168	3080	840	56	56		Negative
14	9400	5593	3008	517	141	24	117	Negative
15	10200	6478	2856	510	204	127	25	Negative
16	9600	6000	2688	720	48	96	48	Negative
17	9800	6028	2670	686	294	98	44	Negative



CASE 58. J.G. aged 55 male. slipped on the stairs and sustained a Potts fracture about 8P.M. on February 18th. Patient is a strong well built man.

NOTES on the TEMPERATURE. The day after admission the temperature reached its maximum 99.2°o coming down next day to normal and remaining after this slightly subnormal.

THE BLOOD. The total numbers of the leucocytes was never above 8600 and the Polymorph percentage never rose above 65 both of which figures were reached on the fourth day after fracture. The Small Mononucleateds were at their maximum on the day after fracture while the Large Mononucleateds were at their maximum on the fourth day as were the Eosinophiles. The Transitionals and Mast cells varied considerably.

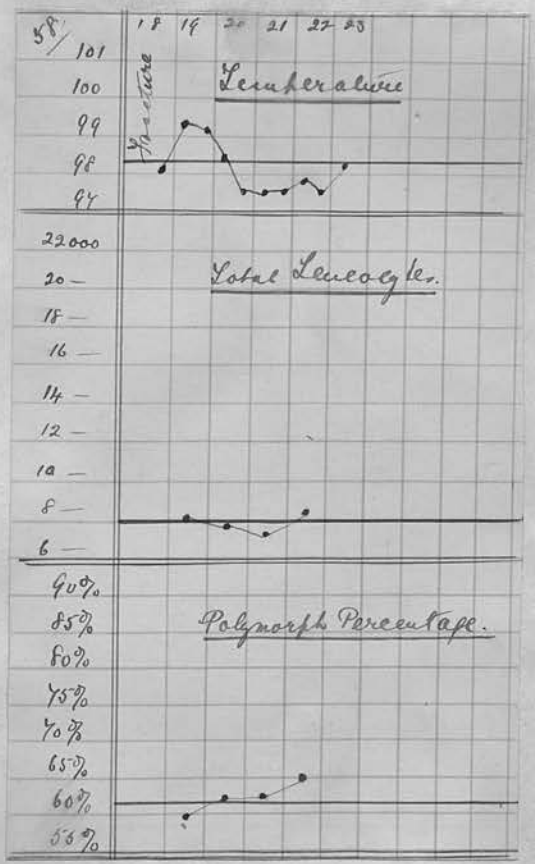
THE CURVES shew the slight rise in the temperature on the first day with practically no change in the blood.

BLOOD EXAMINATION and PROPORTIONAL DIFFERENTIAL.

	Leuc.	Poly.	S.M.	L.M.	T.	E.	Mast.
18.8Pm.	Fracture.						
19.3Pm.	8000	60	37.5	1	0.5	0.75	0.25
20.1Pm.	7800	62	35	2.5		0.5	
21.3Pm.	7200	63	31	4.25	0.25	1	0.5
22.3Pm.	8600	65	28.25	4.5	0.25	1.75	0.25

GLYCOGEN REACTION and ABSOLUTE DIFFERENTIAL.

	Leuc.	Poly.	S.M.	L.M.	T.	E.	Mast.	
19	8000	4800	3000	80	40	60	20	Negative
20	7800	4836	2730	195		39		Negative
21	7200	4536	2232	306	18	72	36	Negative
22	8600	5590	2430	387	21	151	21	Negative



CASE 59. M.N. (female) aged 40 sustained a fracture of both bones of the leg. Patient was slightly drunk at the time (about 6 p.m. 4th March). Patient is a well built healthy looking woman.

NOTES on the TEMPERATURE. The morning after the fracture, the temperature rose to 99.2°, coming back to normal the same evening and remaining subnormal thereafter.

THE BLOOD. The Red Blood Corpuscles shewed practically no variation as did the Leucocytes. The percentage of the different types of cells varied very little.

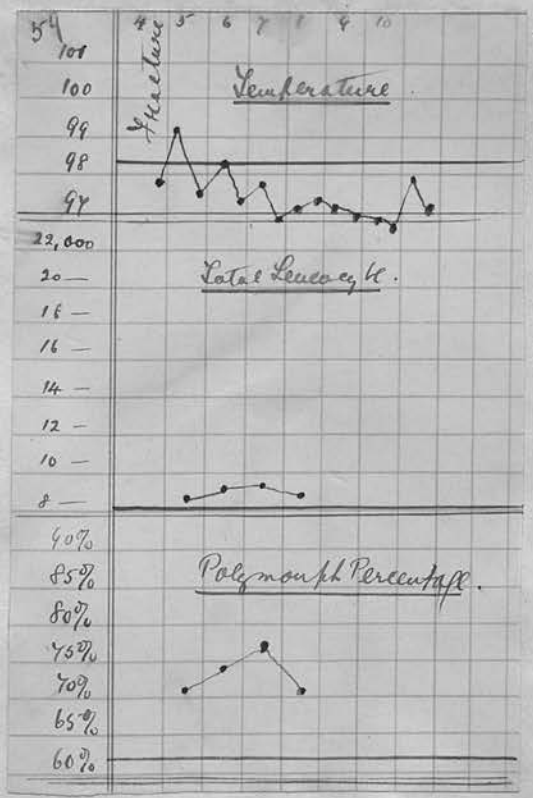
BLOOD EXAMINATION and PROPORTIONAL DIFFERENTIAL.

R.

4.	6 Pm.	Fracture	Leuc.	Poly.	S.M.	L.M.	T.	E.	M.
5.	3 Pm.	3850000	8800	71	20	7.5	-1	0.5	-
6.	1 Pm.	3700000	9000	74	19	6	-	0.5	0.5
7.	4 Pm.	3450000	9200	77.5	18	4	-	0.25	0.25
8.	3 Pm.	3830000	8600	70.5	24	4	0.25	1	0.25

GLYCOGEN REACTION & ABSOLUTE DIFFERENTIAL.

	Leuc.	Poly.	S.M.	L.M.	T.	E.	M.	
5.	8800	6248	1760	660	88	44	-	Negative
6.	9000	6660	1710	540	-	45	45	Negative
7.	9200	7130	1656	368	-	23	23	Negative
8.	8600	6064	2064	344	21	86	21	Negative.



CASE 60. R.B. aged 58 (male), sustained a Pott's Fracture about 7 p.m. on March 11th. Patient was a healthy looking man.

NOTES on the TEMPERATURE. The temperature rose the day after the fracture to 99.6°, coming down next day to normal, and remaining thereabout.

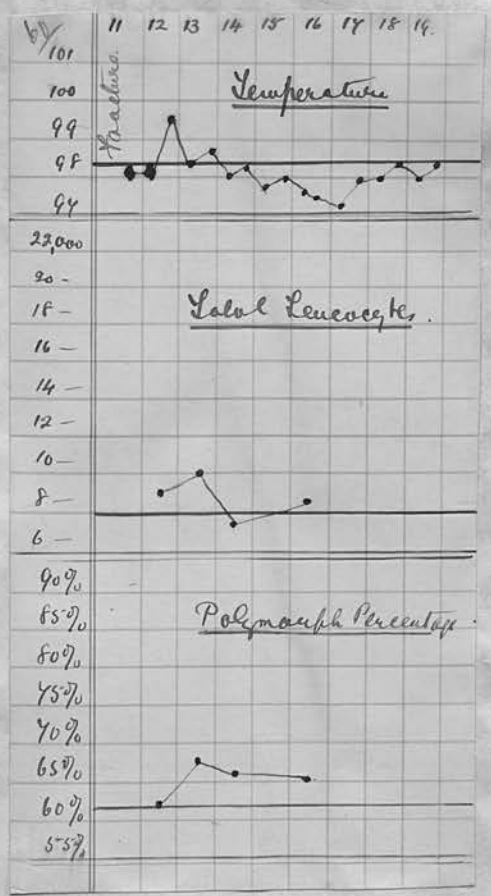
THE BLOOD. The Leucocytes varied very little, being at their maximum on second day after fracture, when the Polymorphs also were at their maximum. The Polymorphs and the Small Mononucleateds varied little, while the Large Mononucleateds were at their maximum on day after fracture, and decreased progressively from then, onwards. The Eosinophiles were variable as were the Mast Cells.

BLOOD EXAMINATION & PROPORTIONAL DIFFERENTIAL.

	Fracture.	Poly	S.M.	L.M.	T.	E.	Mast.
11.7pm.							
12.2.3Pm.	9000	62	29.5	7	0.75	0.5	0.25
13. 1Pm.	10000	68.5	25.5	5.5	-	0.25	0.25
14. 3Pm.	7400	66	28.25	4.5	-	1	0.25
16. 1Pm.	8200	65.5	31	2.75	-	0.25	0.5

GLYCOGEN REACTION & ABSOLUTE DIFFERENTIAL.

	Total	Leuc.	Poly.	S.M.	L.M.	T.	E.	
12.	9000	5580	2655	630	67	45	23	Negative.
13.	10000	6850	2550	550	-	25	25	Negative.
14.	7400	4884	2090	333	-	74	19	Negative.
16.	8200	5371	2542	225	-	21	41	Negative.



The following experiments were carried out in connection with metabolism under anaesthaesia and the blood was examined as follows.

I. Experiment. Dog (bitch) was chloroformed from 10.30 A.M. to 12.30 P.M. on 11th Novr. and again on same day from 3 to 4. The Temperature records were taken daily.

THE TEMPERATURE, which prior to the Chloroform had been 102° and 102.6° on the different days, fell after the Chloroform to 98.6°, rising next day to 101.6°, but not exceeding the former average.

THE BLOOD.

A. The Red Blood Corpuscles immediately after the Chloroform were practically the same as the day previous, but on the two following counts shewed a distinct rise in their total. There was no difference in the films to be noted.

B. The Leucocytes, which prior to Chloroform had been about 21,000, were still at that figure immediately after the anaesthaesia, falling, however, to 17,000 next day, and remained below the average, being only 18,000 two days after the Chloroform.

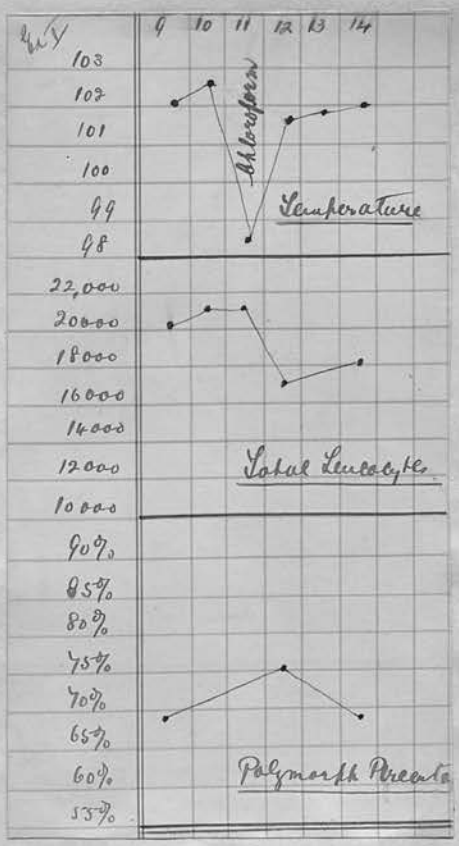
The Polymorphs were slightly increased in percentage, while the MONONUCLEATEDS were slightly decreased. THE EOSINOPHILES were increased on the 2nd day.

This/

This experiment shews the marked fall in temperature immediately after the anaesthaesia, and the decrease in the leucocytes, lasting for several days.

BLOOD EXAMINATION & PROPORTIONAL DIFFERENTIAL.

		Reds	Whites.	Poly.	M.	E.
9	3 Pm	-	20000	68.5	30.5	1
10	3 Pm	6100000	21000	-	-	-
11	Chloroform 3 hours					
11	4 Pm	6000000	21000	-	-	-
12	12 Nn	7000000	17000	75	24	1
14	12 Nn	6500000	18000	68	27.5	4.5



II. Experiment. A dog (bitch) was chloroformed from 10.30 till 12.30 on the 24th February. The Temperature, on the third day after, shewed a considerable drop, rising gradually however.

THE BLOOD.

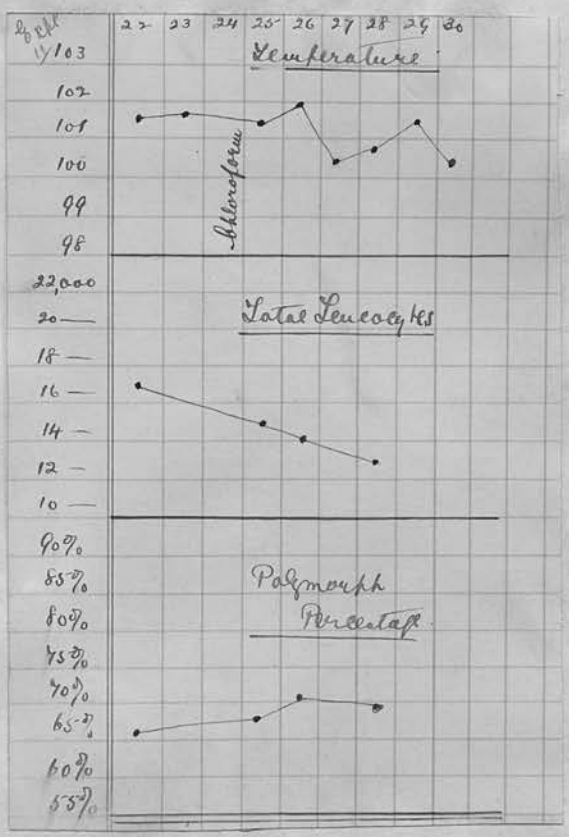
A. The Red Blood Corpuscles shewed a slight increase 2 days after the anaesthaesia.

B. The Leucocytes, which prior to the anaesthaesia were 17,000, dropped to 15,000 the day after, & were as low as 13,000 on the 4th day after.

The Polymorphs were very slightly increased from 66 to 68½% and then 70½%. THE MONONUCLEATEDS shewed a slight decrease on the 2nd day after, increasing again on 4th day. THE EOSINOPHILES were variable.

BLOOD EXAMINATION & PROPORTIONAL DIFFERENTIAL.

	REDS	LEU.	P.	M.	E.
22.3	5900000	17250	66	32	2
24	Chloroform				
25.2	-	15000	68.5	29	2.5
26 12 N.	6500000	14000	70.5	25	4.5
28 2	-	13000	69	30	1



The result of both these experiments was

1. Red Blood Corpuscles shew no change except a slight increase in their numbers which persisted.

2. The Leucocytes definitely decreased in both cases: to a certain extent this was progressive.

3. The Polymorphs shew a slight increase after Chloroform, while the Mononucleateds shew a slight decrease, but in absolute numbers the Polymorphs were practically stationary.

THE GLYCOGEN REACTION.

Of the 50 cases tested with Iodine solution for this reaction in the leucocytes

27 gave a negative reaction and
23 gave a faintly positive reaction, of the first stage. In no case was this at all well marked, and it usually simply consisted in the faintest brownish coloration of the protoplasm of the polymorphs.

7	gave	the	reaction	on 1 day
5	"	"	"	on 2 days
6	"	"	"	on 3 days
5	"	"	"	several days.

Two of these cases gave the reaction previous to operation.

1. There seemed to be no method in its occurrence; in some cases the reaction was got immediately after operation and in others not till several days had elapsed.

2. There seemed to be no relation between an elevated temperature and the reaction. In Case 10 where the temperature never rose above 98.6 the reaction was got on 3 days. In Case 19 temperature rose to 100.6 & there was no reaction, and so with many other cases.

3. It was not only not usually got at the time the leucocyte count was at its maximum (4 hours after operation) but it occurred even where the leucocyte count never rose or had risen very high, and also it did not occur often when the leucocyte count was high.

Case/

Case 37 where the leucocyte count rose to 35,000 and no reaction was got.
Case 16 where the leucocyte count rose to 31,500 and a reaction was got.
Case 3. Leucocyte count 15,000 and reaction, and so with many other cases.

4. In the same manner the reaction did not seem to coincide with a large polymorph percentage or even to occur later on in the same case where a large polymorph percentage had been.

Case 8. Polymorph percentage 93 and no reaction.
Case 14. Polymorph percentage 93 and positive reaction.

5. In only 3 of the positive reaction cases was there a suspicion of the case being septic; in two Bacillus Coli were got later on, and one, a hernia, went slightly septic, but in 2 cases of excision of semi-lunar cartilage which gave so much anxiety, no reaction was obtained.

6. The reaction did not occur in the only 3 cases where Ether had been used alone, nor did it occur in the blood of the dogs which were chloroformed, but otherwise it seemed to occur quite independently of the anaesthetic or sequence.

The general conditions under which this Glycogen intracellular reaction occurs have been summarised by Gulland (1)

1. Severe disturbance of respiration.
2. Anaemia.
3. Toxaemia of metabolic origin.
4. Suppuration.

Locke/

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(1) Gulland, British Medical Journal, April 16th, 1904, page 880. "The Glycogen reaction in blood".

Locke (2) found it present in every case of Appendicitis, from the cases where there was the slightest active inflammation to the most marked case of suppuration general and Peritonitis.

In none of the Fracture cases was there a positive reaction.

(2) Locke quoted by Cabot, Clinical Examination of the blood page 255.

A SUMMARY
of
THE PREVIOUS WORK ON THE SUBJECT.

Gaitskell (in Guy's Hospital Reports Vol.57 pages 65 to 88) seems to have been the only person in this country to investigate the post-operative blood changes. He investigated 5 cases where healing by first intention should have taken place: in 4 of these No. 11, 12, 13 & 14, this did take place. Two of these were Varicose Veins (which can scarcely be counted major operations). In the first, the leucocytes increased from 10,600 to 12,180, temperature 99.4; in the second from 5,600 to 10,300, temperature remained subnormal. The third was a knee joint case, where temperature rose to 100.6°, and leucocytes from 10,300 to 12,180. The fourth was Appendectomy where temperature rose to 99.2 and leucocytes from 7,130 to 14,060. In three of these there was a marked increase in the polymorphs. The 5th case was No. 18, which went septic. Prior to operation leucocytes numbered 8,400, day after 16,000, 2nd day 19,000, 3rd day 19,000, 4th 16,500, 5th 13,000 and increase in polymorphs. This case is of especial interest as we see the elevated count remaining so for many days.

These/

These figures are from the charts, after page 88.

King, (in the American Journal of Sciences, Vol. 124, page 450) seems to be the only one who has gone carefully into the changes. He did two series of cases; the first of 10 cases, 9 of which were gynecological. Here he did daily leucocyte counts for a few days after operation, but no differential, and a second series of 7 laparotomies where he did differential counts as well, on count previous to operation, 24 hours after, and about four days after.

On his average of 17 cases, the maximum of the leucocytes was reached at 1st count (6 to 12 hrs after) in 9 cases, and in (24 to 30 hrs after) in 6 cases, and after 2 days in 1 case. His five highest counts were 26,300, 24,000, 21,500, all six hours after operation, and 20,900, 20,000, both 24 hours after operation, while the lowest rise was from 6,300 to 7,200. King found (page 457) that the polymorphs increased in practically all his cases very markedly, the highest being 86% (30 hours after), but in a case of malignant disease of ovary the polymorphs declined from 82 to 81%.

Da Costa and Kalteyer (1) who examined a series/

(1) Da Costa & Kalteyer, Annals of Surgery, vol. 34, page 329.

series of over 50 cases did so primarily to investigate the red cells after Ether, they seem to have made only one count after operation and do not tabulate the results of their leucocytes counts, simply summarising them, saying on page 344 that "the number of leucocytes varied greatly before and after operation. The average count preceding operation was 9898, and the average count following was 14,484, shewing an average gain of 4,586 per cubic millimetre. In 43 instances the leucocytes were increased while in 9 instances the number was decreased after operation". It is not stated whether the count was done in these cases immediately after operation or not.

Cabot, Blake and Hubbard (2) examined a series of 47 cases, counting the blood before operation and then after the operation, evidently immediately after the operation was finished. They found (page 366) that after operation the leucocyte count was increased 2,000 or more in 35 out of 47 cases, & 3,000 or more in 27 cases. In a few cases leucocytosis was considerable. Regarding the duration of the leucocytosis they had notes on only 10 cases and from/

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(2) Cabot, Blake & Hubbard. Annals of Surgery, Vol 34, page 361.

from these it appeared that within 36 hours of the operation the leucocytosis had generally disappeared.

White (3) found an average of 21,000 leucocytes per C. M. after laparatomy. The highest counts were found about 5 hours after operation and from this time the number of leucocytes gradually diminish reaching normal on the average in about 5 days, while if complications occur the leucocyte count remains elevated or is slower in falling.

White also found that in cases sewed up tight, the leucocytes returned to normal more rapidly than in those drained.

Frazier and Holloway (4) out of 40 cases found that the leucocytes invariably increased.

1. In 7 cases of malignant tumour from 11,000 to 24,777.
2. In 12 inflammatory cases from 12,498 to 20,414.
3. In 21 non-inflammatory cases from 9,748 to 20,043.

Frazier concludes that the leucocytosis increases in general with the extent of the operation, & is not affected by fever, nor by the administration of ordinary drugs, by vomiting, sweating and purging or/

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(3) White, quoted by Cabot, Clinical Examination of the blood, page 254.
(4) Frazier & Holloway, quoted by Ewing, "Clinical Pathology of the Blood" page 110.

or pain. In uncomplicated cases, the leucocytes returned to the normal in about $3\frac{1}{2}$ days.

THE POSSIBLE CAUSES of THESE CHANGES IN THE LEUCOCYTES.

The changes that take place are thus very marked and now one wishes to consider if they are at all in proportion to the loss of blood at the operation.

1. The series of cases includes operations where there is practically no loss of blood, as in the ordinary Radical Cure for Hernia, and simple Appendectomy.

2. Operations where there is slightly more loss of blood, and

3. Those where the loss is fairly great, as amputation of the breast (a full list of operations is put along with the tables on page 226)

TEMPERATURE. The effect in the different groups on the temparature seems very slight as regards the height, but the temperature remained above normal longer in the cases of group III. than in the others, 3 days as against 1.9, and 2 in groups I. & II.

THE BLOOD. The Leucocytes in the different groups more than doubled their own average, and in group II. we have the most marked increase, then in group III. and least of all in group I. There is not much difference between I & III, and so also the leucocytosis continues slightly longer in group III than in group I.

THE /

THE POLYMORPHS.

The amount of haemorrhage here also seems to have very little influence on the increase, in group I being 23.5% which is only 2% less than that in group III which, however, was 2% less in its turn than group II. The duration of this increase also was practically the same in the three groups, being least (3 days) in group II, and then 3.2 days in group I and 3.3. days in group III.

The amount of haemorrhage also seems to have very little effect on the condition of the SMALL and LARGE MONONUCLEATEDS and on the EOSINOPHILES. From the internal evidence here given one would say definitely that the haemorrhage has practically nothing to do with the various changes. The small change in the red blood corpuscles and in the Haemoglobin point to the fact that in no case was the blood loss severe.

It is undoubtedly a fact that severe haemorrhage causes a leucocytosis. Dock (5) reports a severe case of epistaxis where death occurred, and the red blood corpuscles fell to 357,000 and the leucocytes rose to 30,500, with an absolute increase in all varieties. In most of the other cases reported there/

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(5) Dock - Trans. of Association of American Phys. 1899, page 130

there was also severe trauma and it is difficult to say whether the leucocytosis was due to the trauma or to the haemorrhage.

Thayer (1) found that, in cases of haemorrage from the Bowel in typhoid fever, the leucocytes shewed no appreciable change in half of his cases, while in the rest there was some leucocytosis reaching its maximum in from 12 to 24 hours, and returning to normal in from 2 to 7 days.

From the evidence of these different investigations one sees that a large haemorrhage per se will cause a considerable leucocytosis, but as in the operation series in no case was there really a severe haemorrhage, and as in most, the haemorrhage was very slight, and as the blood changes were practically the same in the different groups, whether the haemorrhage was slight or rather more, one is forced to the conclusion that the various changes in the leucocytes are not due to the haemorrhage.

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(1) Thayer quoted by Cabot - Clinical Examination of the blood, page 202.

COMPARISON of ANALYSES OF THE DIFFERENT GROUPS OF OPERATIONS Classified according to the Haemorrhage.

I. GROUP.

Where there was a maximum of haemorrhage.

Hernia	6	Cases
Appendicitis	10	"
Other Laparotomies	7	"
Others	8	"
	31	Cases.

II. GROUP.

Where there was slightly more Haemorrhage.

Ventral Hernia	5	Cases
Breast	2	"
	7	Cases.

III. GROUP.

Considerable Haemorrhage.

Amputation of Breast etc.	5	Cases
Others	2	"
Bone Operation	4	"
	11	Cases.

	GROUP I. 31 Cases.	GROUP II. 7 Cases.	GROUP III. 11 Cases.
TEMPERATURE.			
AVERAGE OF THE MAXIMUM	99.53°	99.14°	99.5°
The maximum recorded on day of Operation	11 Cases	4 Cases	3 Cases
" 1st day after "	14 "	2 "	3 "
" 2nd " " "	6 "	1 "	5 "
The lowest Maximum	98.4°	98.8°	98°
	2 Cases		
" highest "	100.6°	99.8°	100.4°
The Temperature returned to normal -			
On 1st day after operation in	6 Cases	2 Cases	-
" 2nd " " "	7 "	2 "	1 Case
" 3rd " " "	12 "	2 "	3 "
" 4th " " "	3 "	1 "	6 "
" 5th " " "	1 "		
" 7th " " "			1 "
The average time the temperature was above normal was -	1.9 days	2 days	3 days
A subsequent rise noted in	2 Cases		2 Cases
THE BLOOD.			
THE LEUCOCYTES			
Average prior to Operation	8300	8000	8700
Maximum av.after "	17500	21000	19600
" gain	9200	13000	10900
The lowest maximum recorded was	9500	15500	12000
The highest " "	31500	35000	30000
Maximum was reached on day of Operation	22 Cases	7 Cases	9 Cases
" 1st day after "	8 "	-	2 "
" 2nd " " "	1 case	-	-
The average number of days the Leucocytes were above normal was	3.13	3.5	3.6
The earliest return to normal being on	1st day	2nd day	3rd day
The latest " "	6th "	6th "	7th "

	GROUP I. 31 Cases	GROUP II. 7 Cases	GROUP III. 11 Cases.
THE POLYMORPHS.			
Average prior to operation	60.5%	58%	62%
Maximum av. after "	84%	85.5%	87.5%
Average gain	23.5%	27.5%	25.5%
The lowest maximum was	69.5%	78%	76%
" highest " "	94%	90%	92%
The maximum was reached on -			
Day of Operation in	27 Cases	6 Cases	10 Cases
1st " after "	3	1	1
2nd " " "	1	-	-
The number of days before the Polymorphs returned to normal was	3.2	3	3.3
The earliest return being on	1st day	2nd day	1st day
" latest " "	6th "	6th "	6th "
THE SMALL MONONUCLEATEDS			
Decrease in	30 Cases	7 Cases	11 Cases
The maximum decrease was noted -			
On day of Operation in	19 "	4 "	6 "
" 1st" after " "	7 "	3 "	4 "
" 2nd" " " "	4	-	-
" 3rd" " " "	-	-	1
THE LARGE MONONUCLEATEDS			
Increase in	29 Cases	6 Cases	11 Cases
The maximum increase was noted on day of operation in	8 Cases	2 Cases	-
" 1st day after "	15 "	2 "	11 "
" 2nd " " "	4 "	1 "	-
" 3rd " " "	2 "	1 "	-
THE EOSINOPHILES			
Decrease in	25 "	7 "	11 "

II. The Relation of the severity of the operation to the Leucocytosis.

The question of the severity of the haemorrhage has been considered elsewhere. (page 223).

The severity of the operation seems to have had very little effect on the occurrence of the leucocytosis, - although it seems to have some relation to the extent of the leucocytosis.

In Group I. we have the series with the semilunar cartilage, and other like varicose veins , vacicolele etc. Here we have the lowest average maximum, 14,700 after operation. Then we have the Hernia Group with 17,000 as their average, and the Laparotomy Group with 16,400. Here we have operations as Gastro-enterostomies, which were about the most severe, investigated, with a lower count than the Hernia Operations, which are much less severe.

Then come the Appendicitis Group, and the Breast Group.

We can judge by our figures that the severity of the operation, although it seems to have some relation to the Leucocytosis present, still does not seem to coincide at all with the presence of the leococytosis, and only to a slight extent with the size of the leucocytosis. In the same way a high Polymorph percentage does not seem to be coincident with the severity of the operation.

III./

III. What effect has the anaesthetic employed on the leucocytes of the blood? The anaesthetics employed have been Chloroform in the vast proportion of the cases. Pure Ether in only 3, and various mixtures and sequences in the others. (1.) An endeavour was made to get operations where for various reasons local anaesthetics were employed, but only two such cases were able to be examined. (2.) One case was examined where Chloroform was given in order to break down adhesions by forcible movement. (3.) And finally advantage was taken of Dr.Noël Paton's experiments on the metabolism after anaesthetics, to examine the blood, in two cases where Chloroform was administered to a dog, in the one case for three hours, and in the other for two hours.

C A S E S .

A. No.28 J.H.Gastrostomy performed under Cocaine and Adrenalin. The Leucocytes rose from 12,000 to 22,000, and the Polymorphs from 74.5% to 90%, and the temperature to 100.4°.

B. No.23 Mrs MacN. Varicose Veins were operated on under Cocaine and Adrenalin. The Leucocytes rose from 8,900 to 14,200, and the Polymorphs from 58% to 70.5%. The temperature did not rise above normal.

Then on the other hand we have -

C./

C. No.21 M.C. ankylosed jaw moved under Chloroform, where the leucocytes fell from 7,800 to 6,800 and the Polymorph percentage from 67 to 65 and the temperature rose to 99°. (no cutting performed.)

D. Expt.1. where a dog was Chloroformed for 3 hours and the leucocyte fell from 21,000 to 17,000, and the Polymorphs showed a slight rise from 68.5 to 75% and the temperature was slightly lowered.

E. Expt.2. Dog chloroformed for 2 hours, the leucocytes fell from 17,250 to 14,000, and the Polymorphs rose from 66% to 70.5%, the temperature here also being slightly lowered.

The only author who discusses the effect of Chloroform on the leucocytes is Benazzi (1.) who states that Ether produces in animals a slight leucocytosis while Chloroform causes the Leococytes to diminish.

The effect of Ether upon the blood is one on which far more work has been done, although most of this has been in connection with its hoemolytic action, still there are certain observations on its action on the leucocytes worth recording here. Chadbourne (2.) found that there was an increase of leucocytes/

(1.)Benazzi. quoted by Bezancon et Labbé, Traité Hoematologie page 689.

(2.) Chadbourne in Phil.Med.Journal Feb.18 1899.

leucocytes in patients after Ether had been administered 16 minutes. In 21 cases this increase averaged 37%; in differential counts of 5 cases the increase was found to affect Polymorphs and Lymphocytes to nearly an equal degree.

Da Costa and Kalteyer (1) found an average increase in 50 cases of 4,586 leucocytes per C. M. but here the count was not taken till after the operation so it is impossible to take this as evidence on the influence of Ether.

Cobot, Blake and Hubbard (2) examined 50 cases before Ether and after anaesthaesia had been established, but before the operation was performed. Out of the 50 cases, only 13 shewed an increase of 2,000 leucocytes and upwards, while 7 shewed a diminution of the leucocyte count. The greatest increase in one case was 10,400.

Anders and Boston (3) state that "while Ether generally excited leucocytosis this condition was of short duration, the leucocytes per C. M. returning to normal within 12 to 30 hours. Differential leucocyte counts were never found to shew any points/

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(1) Da Costa and Kalteyer - Annals of Surgery, vol 34 page 344.
(2) Cobot, Blake & Hubbard - Annals of Surgery, vol 34 page 362.
(3) The Therapeutic Gazette Novr. 17, 1904 page 730

points of interest or of value".

In 3 out of the 4 animal (rabbit and cat) experiments the leucocytes reached their highest point in from 20 to 30 minutes, while in the 4th the leucocytes were greatly reduced. In the human subject in 3 cases the leucocytes were increased considerably in 2 cases, and in the 3rd only very slightly at the end of 20 minutes.

From these various authorities, one is led to the opinion that in contrast to Chloroform, Ether anaesthaesia produces at any rate in a porportion of cases a definite leucocytosis, and that here we have an absolute increase of the different cells.

The 3 operations performed under pure Ether gave practically the same results as those under Chloroform. The maximum of the total leucocytes varied from 15,000 to 24,800 and that of the polymorphs from 75% to 84%

We are now in a position to draw some deduction although the series of cases is too small to permit us to be dogmatic.

I. Judging/

I. Judging from Cases A. & B. it is possible to get a leucocytosis running up to 22,000 and a polymorph percentage as high as 90% in a severe operation, and even in a minor operation to get a considerable leucocytosis and polymorph increase where we have simply employed a local anaesthetic. The Varicose Veins produced as great a change as many of the ordinary operations under a general anaesthetic.

II. Judging from Case C. and Expts D, & E, Chloroform per se does not produce either a leucocytosis or a marked polymorph rise. In all 3 we have a decrease of the leucocytes and in 2 of them a very slight rise in the polymorph percentage, while in the C. we have also a slight decrease in the polymorph percentage.

Taken along with Benazzi's result one is able to say that the ordinary post-operative leucocytosis and high polymorph percentage is not due to the general anaesthetic, where that has been Chloroform. It is indeed a question if the use of Chloroform does not retard the rise of the Leucocytes. In Case A. the leucocytes remained high far longer than usual, while there was absolutely nothing in patient's condition or in the appearance of the wound to suggest that the wound was septic. Benazzi, also would lead us towards/

towards this conclusion.

IV. Is the Leucocytosis due merely to an enormous concentration of the blood? The preliminary general preparation of the patient tends towards the concentration of the blood, and in some cases the anaesthetic also (especially Ether) is held to do so. It has been impossible to entirely exclude the results of purgation, but the comparative counts of the reds and the leucocytes enable one to judge fairly accurately whether the leucocytosis is merely due to concentration or not.

As in no case 4 hours after the operation was there a marked increase in the red count, one is lead to the opinion that the purgation is not severe enough to cause a regular depletion of the fluid constituents of the blood. There seems to have been no experimental work on this subject, all the literature dealing simply with the action of purges on Red Blood Corpuscles. A few instances will shew the relation between the increase in the leucocytes and the condition of the Red Blood Corpuscles.

CASE 42. Amputation of Breast under Chloroform.

R. 4,400,000/

R. 4,400,000 and Leucocytes 7,200 prior to operation
R. 4,200,000 " " 18,600 4 hours after "

CASE 16. Appendicitis Chloroform.

R. 5,150,000 Leucocytes 9,000 prior to operation
R. 5,140,000 " 31,500 4 hours after "

CASE 6. Hernia Inguinal. Chloroform.

R. 4,800,000 Leucocytes 8,200 prior to operation
R. 4,820,000 " 20,400 4 hours after "

CASE 15. Appendicitis. Chloroformand Ether.

R. 4,450,000 Leucocytes 8,600 prior to operation
R. 4,650,000 " 21,600 4 hrs. after "

These cases are typical of the general results and in no case does one find four hours after the operation any concentration of the blood to account for the Leucocytosis.

CASE 31., Where the blood was examined immediately after the operation before a marked rise in the Leucocytes has taken place, shews that the rise is not due to the preparatory treatment.

R. 5,100,000 Leucocytes 9,400 prior to operation
R. 5,200,000 " 10,200 immediately after oper.
" 22,000 8 hrs. after operation.

From these facts one is led to the conclusion that the preliminary purging and general preparation of the patient, does not cause this Leucocytosis after operation.

The after effects of the operation and anaesthetic, as regards sickness and vomiting seem to be slight; this point comes more under the action of the /

the anaesthetic in causing vomiting.

Note 1. The patient was not sick at all in the two cases where no general anaesthetic was given, and yet had a marked Leucocytosis and

Note 2. In the general series of cases, some of the cases were sick after operation, and some were not, and yet the Leucocytosis was as marked in the one series as in the other.

V. The question of the Local preparation of the patient must now be considered. In most cases the surrounding area was prepared the day previously by being shaved, scrubbed up with various chemicals and finally in most cases a poultice was put on. In some cases this was simply boric lotion and in others carbolic acid. As it was thought that this might have some influence on the blood, a case was prepared two days previous to operation and a Carbolic poultice (1 in 60) was put on over a large area, after the part was thoroughly scrubbed, thus acting as massage. After the poultice had been on 20 hours the blood was examined once more.

CASE 24. The Red Blood Corpuscles remained the same; there was a slight increase (1000) in the leucocytes and the Polymorphs were slightly decreased (5.5%). The Eosinophiles were increased. This case reacted very markedly next day after the operation.

This case shews that the mere external application of chemicals and massage in the preparation does not cause the marked changes. Does the local preparation immediately preceding the operation cause the change here? We have to a certain extent the same chemical application with a scrubbing of the parts. This was the method adopted in some of the cases/

cases, while in others the parts were merely washed over gently. The scrubbing which undoubtedly acts as massage might cause a slight and transient leucocytosis. According to Mitchell (1) quoted by Da Costa, massage produces a transient leucocytosis which does not disturb the normal ratio of the different cells; but the scrubbing is continued only for a few minutes and is not nearly so vigorous as massage.

The question of the use of antiseptics at the operation is important, but as in many of the cases there was no direct application of antiseptics to the wound, as in a good proportion of them the operator's hands were washed in sterile salt solution after the preliminary scrubbing, and as the instruments were also washed out in sterile solution, the chance of the wound being irritated by the antiseptic was very small and seems to have absolutely no effect on the results.

VI. Has the leucocytosis any relation to the rise in the temperature? This question is of importance as if the rise in the leucocytes was either coincident/

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(1) American Journal of Medical Sciences, Vol I07, page 502.

coincident with the rise of temperature or followed after it, one might be lead to the opinion that the elevated temperature was the cause of the leucocytosis and 2nd, if they rose together or were present together and if the leucocytosis was absent where the temperature scarcely rose at all, one would either come to the foregoing conclusion or to the likelihood that both the rise in temperature and the leucocytosis were due to the same factors.

A glance at tables 1-50 will shew that the leucocyte count and the polymorph percentage are at their maximum in most cases on the afternoon after the operation (4 hours after) while the temperature had in most cases only started to rise by this time. By the time the temperature has reached its maximum the leucocytes are well down, although in many cases they both reached normal together, because the temperature was above normal a shorter time than the leucocytes were on the average temperature 2.16 days, while the leucocytes were above normal 3.3 days. A few examples will illustrate the differences and resemblances.

CASE 1. Leucocytes at maximum 14,600 on day after operation, temperature at maximum 100.4° on second day after operation, temperature returning to normal/

normal next day, while the leucocytes have scarcely done so on the 3rd day after operation. Here we see 1. a comparatively speaking low leucocyte maximum with one of the highest temperature maximums and 2. the maximum of the temperature 24 hours later than that of the leucocytes.

CASE 7. The leucocytes 20,000 and the Polymorphs 88%, both at their maximum 4 hours after operation, while the temperature was at its maximum 99.2° on 2nd day after operation.

1. A fairly large leucocyte maximum with practically no temperature.

2. The temperature at its maximum 2 days after the leucocytes.

3. The temperature returned to normal on the 3rd day after operation, while the leucocytes did not do so till the 7th day.

CASE 33. The leucocytes 17,000 and the Polymorphs 90% were at their maximum at the same time as the temperature 99.4° on the afternoon of the operation. In this case the temperature and leucocytes returned to normal at the same time, 3rd day.

CASE 4. The leucocytes here shew a considerable rise, 17,600, and the polymorphs a marked rise 90½%/

90½% both 4 hours after operation, while the temperature shewed no rise, the maximum being only 98.6°. Practically all the cases shew the above type of results; this was brought out in each case in the comparison of the curves.

We might draw the following deductions.

1. That the leucocyte maximum and the polymorph maximum in most cases takes place at least 24 hours, and in some 48 hours prior to the temperature maximum, although in some cases the temperature maximum takes place on the day of operation at the same time as the leucocyte maximum.

2. That the leucocytes and the polymorphs remain above the normal longer than the temperature does.

3. That the fall of the temperature from its maximum is often by crisis, while the leucocytes almost invariably fall by lysis.

4. That it is possible to have a fairly considerable disturbance of temperature with what is practically a minimum disturbance of the leucocytes.

5. That the leucocytes and the polymorph percentage often attain a high total where the temperature does not go above normal as in Case 4, or as in Case 16 where/

where the temperature on day after operation is 99.2°, and the leucocyte count 4 hours after operation reached 31,500.

From these facts and deductions it is evident that the temperature does not cause the leucocytosis and it would also appear that the causes of the temperature are not the causes of the leucocytosis, but the evidence as to this is not so positive although one can say that the temperature and the leucocyte changes have no definite relation.

THE AVERAGE RESULTS

of

THE SERIES OF 50 OPERATION CASES.

TEMPERATURE. The average of the maximums recorded was 99.4°. The maximum was noted

	on the	day of	operation	in 18	cases
on the	1st	" after	"	in 19	"
on	" 2nd	" "	"	in 12	"

The lowest maximum was 98°,

The highest " " 100.6°.

The Temperature returned to normal

	on 1st	day after	operation	in 8	cases
on the	2nd	" "	"	" 10	"
on	" 3rd	" "	"	" 17	"
on	" 4th	" "	"	" 10	"
on	" 5th	" "	"	" 1	case
on	" 7th	" "	"	" 1	"

The time the temperature was above normal averaged 2.16 days, and in 4 cases there was a subsequent rise.

THE BLOOD.

The Leucocytes averaged

prior to operation	8,300
maximum after "	18,400
Gain	10,100

The lowest maximum was 9,500
The highest " " 35,000

both of which cases were laparotomies.

The/

The Leucocytes (continued)

The maximum occurred

on day of operation in 38 cases
on 1st day after " " 10 "
on 2nd " " " " 1 case

The average number of days before they returned to normal was 3.3 after the operation; the earliest being on the 1st day and the latest on the 7th day.

The Polymorphs - averaged

prior to operation 60.5%
maximum after " 85.5%
Gain 25%

The lowest maximum was 69.5%

The highest " " 94%

The maximum occurred on

the day of operation in 43 cases
the 1st " after " " 5 "
the 2nd " " " " 1 case.

The average number of days before the polymorphs returned to normal was 3.2,

the earliest being on the 1st day and

the latest " on " 6th day.

THE SMALL MONONUCLEATEDS

decreased in 48 cases

the/

The Small Mononucleateds (continued)

the greatest decrease being noted on

the	day	of	operation	in 29	cases
the 1st	"	after	"	" 14	"
the 2nd	"	"	"	" 4	"
the 3rd	"	"	"	" 1	case.

THE LARGE MONONUCLEATEDS

increased in 46 cases,

the greatest increase being noted on

the	day	of	operation	in 10	cases
the 1st	"	after	"	" 28	"
the 2nd	"	"	"	" 5	"
the 3rd	"	"	"	" 3	"

THE EOSINOPHILES- were decreased in 43 cases, in many of them disappearing from view completely.

DEDUCTIONS TO BE DRAWN FROM THE PRESENT INVESTIGATIONS AND FROM OTHER WORK ON THE SUBJECT.

I. A rise of temperature of 1° Fahr. is a very common occurrence after an operation. This often takes place on the day of operation, but more frequently on the day following and may even be delayed till the 2nd day. In some cases this rise may be as much as 2°.

II. Such a rise of temperature often continues for 2 days. In some cases it returns to normal in a few hours, in others it may remain up for 3 days.

III. This rise of temperature is quite independent of the appearance of the wound, taking place where the wound is healing by first intention and where there is no local irritation at all.

THE BLOOD.

I. The Leucocytes apparently after every operation increase markedly in numbers quite independently of the numbers of the red blood corpuscles. In most cases they more than double their total previous to operation; in some the rise may be small and in others large, the figures after operation varying from/

from 9,500 to 35,000.

II. This increase appears to reach its maximum a few hours after the operation, although it is scarcely noticeable in many cases just after the operation. In some cases, however, it is delayed till the day after the operation.

III. The leucocytes return gradually and progressively towards their normal, there usually being a considerable drop in their numbers within 24 hours of the operation, and within 3½ days of the operation they have reached their former normal.

IV. This increase in the leucocytes is chiefly caused by the enormous increase both in proportion and in absolute numbers of the polymorphs. The average gain appears to be 25% in some cases, however, the increase is small and only a low percentage may be reached. The figures may vary from 69.5 to 94%.

V. This maximum in practically all the cases takes place on the day of operation, usually within 4 hours of it.

VI. The polymorphs tend to return slightly more quickly to their normal than do the leucocytes, as a whole the average time being about 3¼ days.

VII. The increase in the leucocytes is also largely/

largely caused by the Large Mononucleated cells, which in practically every case shew a great rise both in percentage and absolute numbers: this rise is more variable, however, than the increase in the polymorphs.

VIII. The Large Mononucleateds are usually later in reaching their maximum, in most cases it is on the day after the operation and is delayed in other cases still longer.

IX. On the contrary the Small Mononucleateds are decreased in practically every case, in proportion and usually also in absolute numbers; in fact they seem to go in inverse ratio to the polymorphs.

X. The Small Mononucleateds are usually at their minimum on the day of operation but often do not reach it till the day after.

XI. The Eosinophiles in most cases are much reduced in numbers after the operation, and in many cases they even seem to disappear from the circulating blood.

XII. In some cases at the end of 3 or 4 days they are present in greater numbers than they were previous to the operation.

XIII./

XIII. The Mast Cells vary very considerably in some cases being present on every day after operation and in some they are absent right through.

XIV. In about half the cases a very faint Glycogen reaction may be obtained in the polymorphs; in no case is this more than a very faint brownish coloration of the protoplasm. No marked granules ever seem to appear.

The changes in connection with Fractures are not so definite.

TEMPERATURE.

The average of the maximums recorded was 99.2°. This occurred on day after fracture in four cases, and on second day after fracture in six cases. The lowest maximum being 98.4°, and the highest maximum being 100.4°.

The temperature returned to normal -

On 1st day after fracture in 3 cases.
On 2nd " " " " 2 "
On 3rd " " " " 3 "
On 4th " " " " 1 case.

Average time the temperature was above normal, was 1.7 days.

The Red Blood Corpuscles after fracture, scarcely vary at all.

THE LEUCOCYTES.

In six cases the maximum was in primary count either on day of fracture or day after, while in four cases the maximum was in subsequent counts. The maximum varied from 8.400 to 13,000, average being 10,400. The minimum varied from 6,000 to 9,400, the average variation between maximum and minimum being 2,300.

THE POLYMORPHS.

In six cases the maximum was in first count while in four cases it was in subsequent counts.

The /

The maximum varied from 61 to 77.5%, the average being 71%. Minimum varied between 53 and 77%, the average variation between minimum and maximum being 8.4%. THE SMALL MONONUCLEATEDS appeared slightly decreased in first count in four cases, while the LARGE MONONUCLEATEDS appeared increased in first count in seven cases, and the EOSINOPHILES and MAST CELLS were variable.

The only investigations that seem to have been carried out on the blood after fractures, have been conducted by Cobot, Blake and Hubbard (1) They made 35 counts in 23 cases of simple fracture. In these cases there are ten, shewing a Leucocyte count of more than 10,500, but in only six, did the count reach above 12,000. The highest counts were 15,400 in fracture of the pelvis, and 14,800 in fracture of the leg. They do not seem to have done any differential counts, nor to have continued the investigations, beyond the day after the fracture.

Judging from both series of cases, one can draw the following deductions.

(1) After fracture the leucocyte count in about 50% of the cases, is slightly above normal the day /

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(1) Cabot, Blake and Hubbard, Annals of Surgery, Vol, 34. page 336.

day of, and the day after, the fracture, while in the other 50%, the leucocytes appear to be practically normal in numbers.

(2) The Leucocyte count in about 60% of cases, diminishes on subsequent days, while in the remainder there is practically no variation, and there may even be a slight increase several days after the fracture.

(3) THE POLYMORPHS. In 40% of cases, the polymorphs were above the normal on first count, while in the remainder the polymorphs were about normal figures, although, in subsequent counts some of them dropped slightly below normal, while others, (30% of total) increased slightly.

(4) THE SMALL MONONUCLEATEDS were not very variable, although they tended to increase after the first two days. On the other hand the LARGE MONONUCLEATEDS appeared to be considerably above the average in 70% of cases in initial counts, and decreased considerably on subsequent counts. Both the EOSINOPHILES and MAST CELLS varied considerably. In some cases the Mast Cells were considerably in evidence.

A comparison of the condition of the blood after operation and after fracture shews us:-

I. That the Leucocytes after fracture are scarcely increased at all, thus, being very different to the Leucocytes after operation.

II. That the Polymorphs, although slightly increased after the fracture, are nearly 20% less, than they are after operation.

III. The Large Mononucleateds are also slightly increased after fracture, but not nearly to the same extent as they are after operation.

IV. The Small Mononucleateds are very seldom decreased after fracture, thus being in striking contrast to what they are after operation.

V. The Eosinophiles do not decrease either after fracture in same manner that they do after operation.

THE EFFECT OF THE GENERAL ANAESTHETIC on the RED BLOOD CORPUSCLES.

Out of the 50 Cases investigated, the Red Blood Corpuscles were counted in 26 Cases.

Of these 17 Operations were done under Chloroform, 2 under Ether, and 6 under various mixtures, and sequences.

The figures are given in detail under each case. A mere summary will be given here.

CHLOROFORM CASES. (17 CASES.)

On the day of Operation (average 4 hours after), the red blood corpuscles had decreased on the average 25,000. In most cases, the difference did not exceed 100,000, which is well within the allowable error of calculation, while in one case there was a considerable increase which was maintained on subsequent occasions, and in three Cases there was a decrease of 200,000 or over, on day of Operation.

CASE 38.	22 - 4,800,000.	CASE 42.	12 - 4,400,000
	23 - 4,500,000		13 - 4,200,000
	24 - 4,300,000		14 - 4,100,000
CASE 18.	2 - 4,800,000.	CASE 29.	27 - 2,850,000
	3 - 4,600,000		28 - 3,420,000
			1 - 3,542,000
			2 - 3,380,000

On/

On the day after operation there were two cases which showed decreases.

CASE 3. 24 - 5,100,000.
26 - 4,500,000

CASE 6. 13 - 4,800,000
14 - 4,820,000
15 - 4,500,000.

In most of the other cases the Red Blood Corpuscles were practically the same the day after operation as they were the day before, but Case 3 caused the average reduction in numbers to be nearly 50,000.

On subsequent days there were slight variations, but nothing to be noted. Of all these Cases No.42 was the only one, where the haemorrhage was at all severe.

Of the four cases where the Hoemoglobin was investigated, one showed a slight decrease of 2% from 102 to 100%, and one showed a slight increase of 5% from 35 to 40%.

The two experiments with Chloroform show in each case an increase.

I. 10th - 6,100,000
11th - 6,000,000 (after chloroform 3 hours.)
12th - 7,000,000
14th - 6,500,000

II. 22nd - 5,900,000
24th - Chloroform for 2 hours
26th - 6,500,000

Judging from these operations and the two experiments, it is rare for Chloroform to cause a considerable decrease in the red blood corpuscles, usually the number per C.Millimetre remaining the same/

same, and in a few cases, evidently as a result of the Chloroform, there was a slight increase of the red blood cells, and there does not seem to be diminution of the Hoemoglobin.

THE MIXTURES - chiefly C.E., seemed to have very little effect on the Red Blood Corpuscles. In no case did the difference exceed 200,000.

ETHER. The only two cases which were operated on with Ether, show such results that they will be tabulated in full.

CASE 17.		CASE 50.	
10 -	5,000,000	9 -	4,920,000
11 -	Operation	10 -	Operation
11 -	4,500,000	10 -	4,560,000
12 -	4,250,000	11 -	4,450,000
14 -	4,500,000	13 -	4,310,000
		14 -	4,200,000

In these two Cases we have a considerable decrease four hours after Operation, in one Case 500,000, and in the other 360,000. The Red Blood Corpuscles continue to decrease, and on the day after in Case 17, they reach their minimum, a total decrease of 750,000, while in Case 50, they reach their minimum on the fourth day, a total decrease of 720,000, after these totals, they begin to recover. The Hoemoglobin-Case 50, was examined, but it showed no variation, being 85% in each case. In Case 17 there was practically no haemorrhage, while in 50 it was considerable. The only work that seems to have been done on Chloroform in/

in this connection, is that by King (1.), who, however, did it simply as an accessory to that on the leucocytes.

CASE I.	Prior to operation	3,800,000	- 50%
	30 Hours after "	4,800,000	- 65%
	130 " " "	4,600,000	- 60%
CASE II.	Prior to operation	4,300,000	- 85%
	24 Hours after "	4,600,000	- 92%
CASE III.	Prior to operation	3,800,000	- 82%
	24 Hours after "	4,700,000	- 85%
	120 " " "	3,900,000	- 85%
CASE IV.	Prior to operation	3,400,000	- 80%
	30 Hours after "	3,900,000	- 90%
	120 " " "	3,100,000	- 70%
CASE V.	Prior to operation	3,600,000	- 70%
	24 Hours after "	3,800,000	- 75%
	11 days " "	2,400,000	- 55%
CASE VI.	Prior to operation	3,400,000	- 80%
	30 Hours after "	3,500,000	- 80%
	150 " " "	3,000,000	- 80%
CASE VII.	Prior to operation	3,100,000	- 50%
	30 Hours after "	3,900,000	- 65%

(1.) King. American Journal of Sciences. Vol.124 page 460.

These cases of King's show at the end of 30 hours an increase on the average of 700,000 Red Blood Corpuscles, and of nearly 8% in the Hoemoglobin. Now this increase is not simply due to the concentration of the blood prior to the anaesthetic. This concentration is transient,& does not last for more than a few hours.

In the 5 Cases examined at the end of 120 hours or longer, in two cases there is still a marked increase,and in three there is a decrease in the number of red blood corpuscles, while in only one is there a real decrease of Hoemoglobin colour index, and the one where the greatest decrease of Red Blood Corpuscles was present was not examined till 11 days after the operation.

Da Costa and Kalteyer (1) in summarising the results of their series of 50 Cases under Ether, say that - "The average Hoemoglobin percentage preceding the anaesthetic state was 89, that following the anaesthetic state being 86, showing a loss of 3 per cent. The Hoemoglobin revealed an apparent increase in 19 Cases, and a decrease in 28, and no loss or gain in three Cases.

The average gain in the 19 Cases was 8.05 per cent, and the average loss in 28 Cases was 7.25%.

Again/

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(1) Da Costa & Kalteyer Annals of Surgery, Vol.34. page 344.

Again they say that the average individual hoemoglobin value preceding the operation was 0.903 while that following was 0.821 showing an average loss of .082.

In 49 out of the 50 Cases the blood decinal was reduced after the operation. They also found that the average gain of Red Blood Corpuscles on their series of cases, was 143,360 per C.M. after ether, blood taken at various periods after the anaesthetic.

Von Lerber (1) states that in a series of 101 Cases, he found the Hoemoglobin unaltered in most instances, and that the red blood corpuscles were very little changed either in number or appearance.

Frazier & Holloway (2) in their series of 40 Cases, found 48 Hours after Ether, an average decrease of 210,000 Red Blood Corpuscles, and of 2.5% Hoemoglobin.

Anders and Boston (3) found in their experiments in animals that the Hoemoglobin was reduced in every instance as a result of the Ether on the Reds/

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(1). Von Lerber. Quoted by Da Costa & Kalteyer annals of Surgery Vol.34. page 333.

(2.) Frazier & Holloway. Quoted by Ewing. Clinical Pathology of the Blood. page 110.

(3.) Anders & Boston. Therapeutic Gazette. Novr.17, 1904, page 729.

Reds varying according to the length of time the anaesthetic was continued. Approximately 10% of Hoemoglobin was lost during the first 20 minutes, after the anaesthetic state was established. The Hoemoglobin reached its lowest point 24 to 30 hours after Ether anaesthaesia, and from their investigations on the human subject, they found the same reduction, even although at the end of 20 minutes there was an increase of Reds

ANIMAL EXPERIMENTS.

			RED.	
I.	Rabbit.	Prior to	4,460,000 -	Hb. 60%
		20 minutes after	5,750,000 -	Hb. 50%
		24 hrs.af.	4,000,000 -	Hb. 30%
		104 " "	4,300,000 -	Hb. 51%
II.	Rabbit.	Prior to	3,968,000 -	Hb. 65%
		25 mins.aft.	4,300,000 -	Hb. 55%
		1 Hour "	3,280,000 -	Hb. 48%
		58 " "	4,800,000 -	Hb. 64%
III.	Rabbit.	Prior to	2,300,000 -	Hb. 82%
		20 mins.aft.	5,700,000 -	76%
		60 " "	5,400,000 -	72%
		24 hrs. "	5,200,000 -	71%
		48 " "	6,300,000 -	85%

Judging from the evidence before us in regard to Chloroform one can draw the following deduction.

1. Chloroform seems to have little action on the red blood corpuscles in general series of cases. In about 5% of cases it causes a considerable destruction of red cells while in about 25% it seems to cause an increase in the numbers of red cells without having much or any hoemolytic action. In the remaining cases the Chloroform appears to have almost no action either of hoemolysis or of stimulating powers.

2. As in only one case of the eleven recorded cases did the Chloroform reduce the Hoemoglobin at the end of thirty hours and that by only 2%, it seems to have little effect on diminishing the Hoemoglobin present while in many cases the Hoemoglobin was increased in excess of the increase in the reds, this slight excess persisting often to the end.

As regards the effect of Ether there is more evidence which on the whole bears in one direction.

1. Red Blood Corpuscles seem to be very adversely affected by Ether and practically all the records point to a destruction of the red blood corpuscles and in all the experimental work we find a diminution/

a diminution in their numbers but this does not always occur in the human subject.

2. The Hoemoglobin seems almost invariably to be reduced; in some cases there is an apparent increase while there is an absolute decrease per red corpuscle. This decrease seems to come on very rapidly and in experimental work a decrease of 10% was common often after about 30 minutes of ether anaesthaesia; while it persisted, and in many cases the decrease went as far as 30% some time on average 30 hours after ether.

This question of destruction of the red blood corpuscles by the anaesthetic is of great importance in considering the question of operation in anaemic patients as to what anaesthetic ought to be employed and whether it would be better to employ local or general anaesthetics.

Where the red blood corpuscles are much diminished and especially where there is a small percentage of Hoemoglobin,-

1. One would say that other conditions allowing it, the operation would be better performed under local anaesthaesia, because it is evident that if the red blood corpuscles and Hoemoglobin be greatly diminished, it will be impossible for the blood to carry sufficient oxygen to the tissues and especially to the brain and death must result.

2./

2. Where a general anaesthetic must be employed, it would appear that at any rate in relation to the effect on the blood, Chloroform is distinctly preferable to Ether, as the hoemolytic action is very much less and as the percentage of Hoemoglobin in no case seems to be reduced in the same way as it is apt to be with Ether. A person with Hoemoglobin 35% seems to be quite safely operated on under Chloroform, but judging from our figures it is very doubtful, if it would be justifiable to operate on such a patient under ether. What percentage of Hoemoglobin is the minimum that one would administer ether to is certainly very debateable, but when it is not only possible but quite probable to have the Hoemoglobin reduced by Ether by 20% it would seem that at least 40% or even 45% Hoemoglobin should be the minimum accepted.

It would be interesting to know what proportion of the deaths that occur after Ether administration in the first two or three days that are put down to the shock of the operation are really due to the effect of the Ether destroying the red cells and diminishing the Hoemoglobin.

CONCLUSIONS CONCERNING THE LEUCOCYTOSIS

After careful consideration of the evidence on both sides one is driven to the following conclusions regarding the changes in the Leucocytes.

I. That the Leucocytosis is not due to the haemorrhage at the time of the operation although if this be severe, it may undoubtedly increase the leucocytosis.

II. That although the severity of the operation has some effect on the extent of the leucocytosis still it is not the determining factor, some slight operations having much larger rises in the leucocytes than more severe operations have.

III. The anaesthetic employed is also not the determining factor in the changes in the leucocytes although Ether per se does cause a leucocytosis, still all the evidence we have been able to produce is that Chloroform does not cause the changes in the leucocytes as they do not take place in Simple Chloroform cases and as they are found where only a local anaesthetic has been used.

IV. The changes in the leucocytes have no definite relation to the rise in temperature after operation, and as they usually occur before this rise it is evident that the temperature does not cause the leucocyte changes and it is also probable that the causes of these changes are not the same as the causes of the temperature.

V. The Leucocytosis is evidently not due

to /

to the preliminary general preparation of the patient The blood is not markedly concentrated at the time of the operation by the purging, and the effects of this purging although they may produce a disturbance in the leucocytes at the time, have quite worn off by the time of the operation and especially by the time the leucocyte changes are at their maximum. Nor does the blood seem to be so markedly concentrated by other causes such as the Ether to account for the leucocytosis, nor does the vomiting seem to have any effect.

VI. The local preparation also of the patient is not sufficient to account for the changes. The effect of antiseptic application previous to the operation being nil and the scrubbing of the parts although it produces a hyperaemia does not seem to cause the changes in the leucocytes.

B. The use of antiseptics after the operation has started may to a large extent be discounted as the majority of operations are performed now with no antiseptic touching the wound even from the instruments.

VII. The mere presence of blood clot and bruised tissues is not sufficient to cause such a marked change in the numbers and varieties of the leucocytes as, in fractures, where the local damage of/

of tissue is often infinitely greater and where as in the case of the fracture of the patella we may have considerable accumulation of blood, there is nothing like the same change.

THEORY as to the CAUSATION of the LEUCOCYTOSIS.

The changes in the leucocytes, which are to all intents and purposes the same as those seen in a pathological leucocytosis as in pneumonia, abscess formation and peritonitis; must be due to some other factors than the foregoing and we now have to consider the possibilities of their cause.

I. It is not due to any special method of the surgeon operating as the cases in the above series were operated on by six different surgeons and with each one, the changes were practically identical.

II. Leucocytosis may undoubtedly be caused by severe muscular exertion here we have undoubtedly the toxic effects of the effete bodies produced, acting on the tissues and the blood causing a leucocytosis.

(1) Cabot Blake and Hubbard found marked leucocytosis with both relative and absolute increase in the numbers of the polymorphs after a long Marathon race. Here/

(1) Annals of Surgery. Vol. 34 page 372.

Here we have with nothing introduced from the outside, but simply with substances produced by the body, the same marked changes that are found in a pathological leucocytosis. Now is it likely that with operation cases we would get the same results? The chloroform might have caused them in this way, but we have seen that it does not do so, and there seems nothing else in operation cases to cause such a change when fractures do not do so, or only to a very slight degree.

III. The changes are thus evidently a reaction of the body to something introduced from the outside, whether a mere physiological protective reaction, or the definite reaction against micro-organisms, it is impossible to say. Favouring this view is the fact that the polymorphs have given a very slight glycogen reaction in 46% of the cases, and in none of the fractures.

It is well known how, even with the most rigorous methods of purification employed both on the operator's hands and on the patient's skin, it is extremely difficult to clear away all the organisms, especially those that may be lying in the sweat ducts of the patient. It is the simplest thing for a few of these micro-organisms to be introduced into the wound. At once we have a reaction of the tissues against this poison, and in

all /

all our cases where we have healing by first intention, the organisms are so few in number that the Leucocytes are able at once to overcome them without causing any pus formation. This Leucocytosis is thus protective and diminishes the risk of the wound going wrong.

In favour of this theory that the changes in the Leucocytes are really due to the reaction of the tissues, towards bacteria and their toxins, we have the following.

1. That the numbers and varieties of the Leucocytes are essentially the same as occur in an ordinary inflammatory Leucocytosis.
2. The presence of a faint Glycogen reaction in a certain number of the cases. Although the value of this reaction is doubtful, as it is present in other things as well as inflammatory conditions, but the inflammatory condition is the most probable when it develops where it had not been previously.
3. That so many other possible causes of this condition have been excluded.
4. That it is admitted that the thorough purification of the skin is extremely difficult./

difficult.

5. That a very slight infection would be sufficient to account for the blood changes.

Against this theory we have the following points.

1. That the patient gives no sign of an inflammatory infection either local or general, the wound in most cases healing without even the slightest signs of irritation.
2. That so few accidents happen whereas it would appear likely if bacteria were introduced into the wound even in the smallest numbers, that we would have more cases going wrong.
3. The fact that cultures from under the nails and in the folds of the skin after thorough purification are practically always negative.
   (1)
4. J.Tirelli as a result of 39 experiments, 30 on common skin and 9 on disinfected skin from which 409 sections were made and examined both by cultures and by the microscope,/

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(1) quoted in British Medical Journal January 21st 1905. Page 10 (inset).

microscope, came to following conclusion,

(a) that in the skin of ordinary hospital in-patient, where not subjected to trauma or pressure and only scantily supplied by hair, the germs are collected in the superficial strata of the corneous layer and

(b) that the epidermis and hairs and cutaneous glandsare proof against infection, which however, can penetrate into the more peripheral part of the hair follicles.

We see from our evidence that we have absolutely no direct evidence in favour of the leucocytosis being a reaction of the tissues to bacteria, but that there is strong deductive evidence in favour of this view, also that there is strong positive evidence in favour of the absence of bacteria. In the state of our present knowledge it is impossible to say definitely what this leucocytosis is due to, but that it is possibly and quite probably due to reaction of the tissues against bacteria, and if not due to this, it resutls from a reaction of the tissues to some effete bodies produced by the procedure of the operation in the same way that severe exertion/

exertion causes a leucocytosis. There is no doubt that however produced, the leucocytosis is bound to act as a protective agent and that any bacteria that might possibly be present will thus be prevented from developing and will be removed by the phagocytic action of the leucocytes.

CLINICAL APPLICATIONS OF THE RESULTS.

Having thus gone over the Condition of the Blood after Operation and Fracture we wish to see how it can be applied clinically.

I. A. In regard to the question of the anaesthetic, which is to be used, and whether we had better employ a local anaesthetic than a general one. It has been shewn that both Chloroform and Ether have a hoemolytic action. It is thus evident that if the patient is very anaemic and the operation has to be performed, it is infinitely safer from this point of view to employ a local anaesthetic.

B. Where a local anaesthetic cannot be used and we wish to decide upon the general anaesthetic, it has been shewn that Ether has a much more marked effect in hoemolysis than Chloroform and that in some cases we may even get a drop of 20% Hoemoglobin with Ether. /

Ether. From the point of view of the blood, which in a sense is of the greatest importance as on its quality the action of the nervous system and thus of the heart and lungs depends, it is evident that Chloroform ought to be used in preference to Ether where a general anaesthetic is employed. Thus we see that examination of the blood is of the utmost importance prior to operation in order to enable us to decide whether

1. a local anaesthetic should be employed
2. it is safe to use Ether if for other reasons, that is indicated rather than Chloroform.

It is at present impossible to put a figure to the number of Reds and to the percentage of Hoemoglobin that constitute a safe limit for the general as against the local anaesthetic and for Ether as against Chloroform as such can only be worked out when this has been put into practice. Suffice it to say that it seems safe to administer Chloroform for a laparotomy to a patient with only 35% Hoemoglobin.

II. As to the value of the examination of the leucocytes after operation to see if the wound is healing well or if septic mischief is at work:-

From the various cases it is evident that if /

if the leucocytes do not decrease considerably by the second day (see page (218) Gaitskell's 18th case) there is probably something more than the ordinary reaction and that the wound is really going septic. Also if, after the leucocytes have once decreased, we get a considerable secondary rise, we tend towards the same conclusion.

In the same way if we have the polymorph percentage remaining high or rising a second time, we again must look at the wound, but the polymorphs in this connection are not so dependable as the total number of the leucocytes. It is evident that a negative blood examination is in some ways quite as important as a positive one. If we are anxious about the case the temperature being high and the wound looking doubtful, the blood examination is of the utmost value. In such a case if we find that the total number of the leucocytes is decreasing regularly and if the polymorphs are doing likewise and if we get a negative result with Glycogen reaction we have a strong point in favour of the wound being all right.

It is evident, however, from the average condition of the blood that it will be of very little assistance to us on the day of and the day after operation.

From /

From these facts it is evident that Routine examination of the blood of surgical patients is advisable.

1. Before the operation to assist us with the question of the anaesthetic and to give the normal standard of the patient.
2. The night after operation to give us the standard of the reaction of the patient and to enable us to judge on future occasions if the leucocytes are still high or if they are decreasing regularly.

As with all other forms of blood examination it must be remembered that apart from a study of the condition of the patient, the blood examination is fallacious and must not be relied upon, but if taken along with other factors it is a most important point and should be of the greatest assistance in surgical work.